Lab. P. 4

ESSAYS

ON

THE MORBID ANATOMY

OF THE

HUMAN EYE.

BY JAMES WARDROP,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS,
OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETIES, AND
ONE OF THE SURGEONS OF THE PUBLIC DISPENSARY
OF EDINBURGH.

ILLUSTRATED BY PLATES.

EDINBURGH:
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TO

ANDREW WARDROP, M. D.

F. R. S.

FELLOW OF THE ROYAL COLLEGE OF SURGEONS, AND FORMERLY ONE OF THE SURGEONS OF THE ROYAL INFIRMARY OF EDINBURGH, &c. &c.

THIS ESSAY IS INSCRIBED,

AS A TESTIMONY OF THE AUTHOR'S GRATITUDE,

FOR THE PROFESSIONAL ADVANTAGES DERIVED,

AND THE BENEFITS EXPERIENCED,

FROM THE KINDNESS

OF

AN AFFECTIONATE RELATIVE,

AND

SINCERE FRIEND.

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PREFACE.

The object of the following essays is to describe the various morbid alterations in the structure of the human eye, and to illustrate, by engravings, those which are most remarkable.

In the accurate and detailed view which Dr Baillie has given of the morbid anatomy of some of the most important parts of the body, he has not described the diseases of this organ; and, as no attempt has yet been

made in this country to treat of the pathology of the human eye, little apology seems necessary for the present undertaking. Several excellent practical treatises and detached essays, indeed, have at different times been published; but during the last thirty years, the diseases of the eye do not appear to have excited the same attention here as on the continent.

Richter, of Göttingen, has, perhaps, given the best description of these diseases, and laid down the most judicious practical rules that have yet been suggested. Beer, of Vienna, has contributed many useful hints; Voigtel and Sybel have collected a great store of facts connected with the morbid anatomy of the

eye; and CONRADI, SCARPA, and others, have likewise enlarged our knowledge of the treatment of the diseases of this organ. None of these authors, however, have delineated the morbid changes of structure which they have described: A few drawings only are to be found in the works of BEER and SCARPA, and in some periodical publications.

The importance of a work, the object of which is to supply these defects, is sufficiently obvious.

The opportunities which the eye affords to the pathologist, from the variety in its structure and situation, of discriminating all its morbid changes, and of observing their progress, renders it peculiarly interesting; and as there is no organ, the

loss of which can be productive of so many disadvantages, and so various and bitter calamities, without entirely destroying the existence of the individual, its diseases claim the most patient investigation, and deserve the minute attention of medical men.

Although the following pages are devoted exclusively to the investigation of one organ, the author is fully sensible that the task which he has undertaken is attended with considerable difficulty; but if they shall, in any degree, contribute to the attainment of the end proposed, or if they even excite the attention of medical men to so interesting a subject, the author will deem his labours well rewarded. It is only by continu-

ed attention, and patient investigation of the changes produced by disease in all the organs which compose the human body, that we can expect to enlarge the knowledge of the morbid anatomy of each, whilst, at the same time, it is also by a detailed account of the diseases of each separate organ that we can arrive at any general conclusions. But the field of medical science is very extensive, and to explore it with success, requires the co-operative efforts of many individuals; for it is only in proportion as facts are accumulated, and the various morbid appearances investigated, that the phenomena of disease can be understood, the morbid actions explained, the science of medicine freed from erroneous theo-

ries and hypotheses, and its practice liberated from the rash and unskilful hand of empiricism.

The late progress which has been made in pathological science, is a sufficient stimulus to exertion, and affords every reason to expect ultimate success. For, to use the words of Dr Reid, "We may, by caution and humility, avoid error and confusion. The labyrinth may be too intricate, and the thread too fine to be traced through all its windings; but if we stop where we can trace it no further, and secure the ground we have gained, there is no harm done; a quicker eye may, in time, trace it further."

In the following essays, the author has not only stated what he

has had an opportunity of observing himself, but he has endeavoured to collect information from the works of the respectable authors whose names he has mentioned, and from every other source to which he could find access. He ought also to acknowledge himself indebted to the liberality of many of his medical friends, who have afforded him opportunities of examining diseases which were either uncommon, or in any way worthy of notice. His field of observation has likewise been much enlarged, from the extensive opportunities which he has enjoyed in consequence of being professionally connected with Dr WARDROP, who, at an early period, directed his attention to this subject, and from

whom he has derived great assistance during the prosecution of it.

For the drawings which accompany this work, the author is, in a particular manner, indebted to Mr Syme, an ingenious artist of this place. He has combined the art of the painter with the skill of the anatomist; and as he has taken the trouble to retouch all the impressions of the plates, there is a truth and accuracy preserved in the colouring, which is seldom to be met with in works of this kind.

In some of the drawings, several diseases are represented; for every opportunity was embraced of delineating an eye affected with more than one complaint, in order to avoid multiplying the number of

engravings. Those who are not much accustomed to examine the morbid appearances of the eye, may begin with consulting the plates, as they will thence be enabled to form a general idea of the disease represented, and the subsequent account will thus become more clear and intelligible.

If the public shall approve of this essay, it is the author's intention to prosecute his plan, by considering the remaining diseases of the eye and its appendages, and the treatment which such diseases require.

Edinburgh,
April, 1808.

PRELIMINARY OBSERVATIONS.

ALL animals are composed of a certain number of organs, which, under the influence of the vital principle, produce those wonderful phenomena that distinguish living organized bodies. An acquaintance with the relative position, magnitude, and direction, of these organs, is one of the objects of our anatomical researches: On it the surgeon builds all his theories, and it guides his hand in every operation. But, for the advancement of physiological and pathological science, some-

thing more than this species of anatomy is necessary. It can only be considered as the first step towards a knowledge of the functions, and it does not even serve this purpose except under particular circumstances. When the anatomist divided the body into regions and districts, and shaped his inquiries to suit his unnatural divisions, every organ appeared insulated and detached, the most minute parts might have been discovered and described, but their mutual connections and sympathies were unknown. Anatomy and physiology were then disjoined; the former was imperfect, and the latter could scarcely be said to exist.

A more minute and philosophical examination of the structure and properties of the different organs, led the way to a knowledge of some of their functions, and pointed out the principles which should regulate the investigations of every rational physiologist. Haller was among the first to avail himself of the advantages of this plan. It conducted him to all his important discoveries; and

it has determined the progress of every scientific inquirer since his time. To it we are indebted for almost every improvement that has been made in this branch of science; and it is the only method by which we can hope still further to augment our knowledge. In pursuing this track, the labours of modern anatomists have been well rewarded. They have freed physiology and pathology from the nonsensical conjectures by which they were so long debased, so that they now begin to assume their rank among the sciences, and in some cases to afford a safe guide to the medical practitioner.

No one in our day has exerted himself more successfully in this field than the late celebrated Bichât. His *Anatomie Generale* is one of the most remarkable productions that has ever been produced in medical science. It has unfolded a path of investigation which was scarcely ever trodden before, and laid the foundation of a new anatomy and a new physiology. I cannot pretend here to do justice to the merits

of this work, nor to give a correct view of the facts and reasonings by which his doctrines are supported. They are as numerous and various as are the parts and functions of the living body. But, as I propose, in examining the pathological anatomy of the eye, to adopt some of the principles which he has established, the following observations are necessary, in order to explain the purport and tendency of the classification which I mean to adopt.

Most of the organs of our body are made up of a variety of elementary parts, or textures, each of which, in whatever situation it is found, affords uniformly the same physical properties. These are the elementary parts, which, by the diversity of their combinations, produce all the modifications of structure and functions which the different organs of animals exhibit. The study of these elementary parts, independent of the organs which they concur to form, is the object of *general* anatomy.

This method of considering organized bodies, is not an unnatural abstraction, nor a speculative refinement. It arises from the essential nature of their constitution, and it accords with every phenomenon with which we are acquainted. We may trace it in the observations of many of the older anatomists; and it may be considered as the basis of some of the most ingenious physiological theories of the late celebrated Mr John Hunter. Although, therefore, at first sight, it may have the appearance of being arbitrary and artificial, it is nevertheless, I am persuaded, founded on the most approved principles of philosophical investigation. A knowledge of the qualities of the different parts of which our organs are composed, must afford the surest means of acquiring information concerning the functions of these organs, and of becoming acquainted with the changes which they undergo in disease. On these principles Bichât has founded his anatomical system. To numberless experiments upon living animals, he added all the

information which could be acquired by dissection. He employed chemical re-agents to supply the deficiencies of the scalpel, and examined with minuteness all the varieties of morbid structure. By these means he endeavoured to fix the characters of the elementary textures, and then proceeded to investigate their combinations, as they are naturally presented to us in the different organs.

Of these textures, he has enumerated twenty-one, all of which he has shewn to be differently organized; and hence he proves the dissimilarity of their properties, both in health and in disease. This is the ground-work of the whole fabric, and to it we must ultimately recur in every attempt, to account either for the natural or morbid appearances which are to be met with among organized beings.

I mean not at present to enter more minutely upon the consideration of the elementary textures, my object being merely to shew, in a general manner, the effect of this anatomical arrangement, upon our patho-

logical theories. In our notions of all local affections, its influence is obvious; but in those diseases, where there is no evident change of structure, and where all the parts of the body seem to be disordered simultaneously, there is little room for the inquiries of the pathologist. It is, accordingly, in the former class of affections that the utility and advantages of general anatomy are most apparent.

By this view of the subject we have learned that diseases at their commencement are generally confined to one texture, the others of which the organ is composed remaining sound. This important truth is made manifest in many affections of the Eyes; but there is no part of the body, from which illustration of the same doctrine may not be deduced. At different times we see inflammation attacking the conjunctiva, or the various textures which form the cornea; at others, it is seated in the iris, in the capsule of the crystalline lens, the sclerotic coat, &c. The same is true of the different membranes

of the brain; of the mucous, serous, and muscular textures, which compose the stomach, and intestinal canal; of the cellular texture of the lungs; of the mucous texture of the bronchi; the serous one of the pleura, &c. &c.

But diseases are not only confined to one individual texture of any organ, as in the cases just mentioned; the symptoms and morbid changes are likewise uniformly the same in textures of a similar structure, in whatever part of the body these textures may happen to be found. Thus the serous membranes, which invest the lungs, the brain, the heart, the abdominal viscera, have one common character, when affected with any specific disease; so also have the mucous membranes, whether we trace them in the mouth, the nose, the vagina, urethra, or covering the eye-ball; and the same is observable of every individual texture which enters into the composition of our bodies. Dr Carmichael Smyth*, in this country, and

* Vide Medical Communications and Inquiries, Vol. II.

afterwards Pinel *, in France, did much in pointing out the variety in the phenomena of inflammation, in some of the different textures of the body. It was an attempt highly worthy of the authors; but they did not lay down any system, or draw any general conclusions, nor did they attempt to trace the same analogy in other diseases. Thus, although the morbid changes of some of the textures have been ascertained with tolerable accuracy, we are still ignorant of many of the others. This is a field which has hitherto been little explored. It is of boundless extent, and presents inexhaustible subjects of investigation to the genius and industry of future inquirers.

Besides the symptoms and morbid changes which are common to all textures whose structure is similar in the natural state, there are others which are determined from the particular functions of the organ in which the diseased texture exists: For example,

* Vide Nosographie Philosophique.

when any of the *serous* membranes are inflamed, the nature of the pain, the degree of fever, and the duration of the symptoms, are the same in whichsoever one it may have taken place. But to these symptoms are added, cough, difficulty of breathing, &c. when it happens to be connected with the organs of respiration, as in the case of *pleuritis*; costiveness, stranguary, delirium, loss of vision, when the intestines, the bladder, the brain, or the eye, are involved in the disease.

This view of the subject naturally suggests a correspondent division of the symptoms. The first class are general, and characterise a whole genus of textures; the second are in a manner accessory, and depend upon the relative situation, or the particular functions of the organ, into the composition of which the affected texture enters.

The foregoing remarks will tend to explain the object of general anatomy, and the important purposes to which it may be applied, both for illustrating pathology and therapeutics. But here we must set bounds

to this theory;—the history and progress of diseases shews that we ought not to confine our observations within such narrow limits. The principles which I have stated, indeed, account admirably well for the propagation of some affections, and for some of the sympathies which subsist between different parts of the body; but there are other disorders which advance in a different manner. In some diseases which are termed chronic, for example, the whole structure of an organ becomes gradually altered, although the primary affection was confined to one of its component textures. This is often to be observed in cancer, scrofula, lues venerea, &c. When cancer attacks the mamma, it is, at its commencement, generally confined to a small portion of that organ, but if allowed to proceed, it ultimately involves the whole glandular, cellular, and cutaneous textures, in one common mass of disease.

The author, from whom I have adopted some of the foregoing remarks, has, with wonderful ingenuity, illustrated and establish-

ed the theory which I have in part described. In his hands morbid anatomy has assumed a new aspect; and he has pointed out a method of classifying the numerous facts which that science embraces, with a degree of accuracy and precision that was never known before. In prosecuting this science, we ought to examine the symptoms and changes of structure which are to be found in every individual texture, in whatever organ or region it may exist. After ascertaining the alterations proper to every system, we shall be better prepared to investigate the maladies as they take place in different organs of the body, or in different regions.

These general observations will be sufficient to give an outline of the principles of a pathological system, founded on the basis of anatomical knowledge; and when we apply them to the investigation of the morbid anatomy of the Eye, they will be found to afford a happy illustration of the system which I have ventured to adopt. For this beautiful organ is not only composed of a great va-

riety of textures, but the transparency and ready examination of many of its parts in the living body, admit of a great minuteness and accuracy of observation; and the various morbid changes can be seen going on much more distinctly than in any other part of the body.

The parts which form the eye-ball, and which are immediately connected and subservient to the performance of its functions as an organ of vision, as they present a great variety in their structure, they are necessarily liable to a proportionate variety in their morbid changes. The external covering of the eye-ball, eye-lids, and lacrymal passages, or *conjunctiva*, being a *mucous* membrane, we will find that it is subject to all the diseases of the mucous membranes in other parts of the body. The diseases of the cellular membrane, which lies underneath the conjunctiva, are analogous to those of the cellular membrane in other organs. The sclerotic coat, the iris, the choroid coat, the crystalline lens, the optic nerve, the retina, and

the different parts which compose the cornea, are also liable to morbid changes similar to those of the textures in other organs to which they are analogous, the various phenomena being more or less modified from the peculiarity of the functions of the organ.

In the descriptions of the diseases of the eye, which are given in the following essays, I shall divide them into *two* great classes. The *first* shall contain an account of the morbid changes of each separate structure, which enters into the composition of that organ; and, the *second*, an account of those diseases which have a specific character, and have symptoms peculiar to themselves, in whatever structure they appear, or which, when they attack the eye, affect a greater or less number of its different parts at the same time.

Under the first class will be comprehended, the diseases of the Cornea, Iris, Aqueous, Vitreous, and Crystalline humours, Optic Nerve and Retina, Choroid coat, Sclerotic

coat, Conjunctiva and Cellular membrane, Tarsi and Palpebræ, Lacrymal gland and Caruncle.

Under the second class will be included, Rheumatism, Cancer, Scrofula, Lues Venerea, Exanthematous Ophthalmia, &c.

As to the order in which these subjects are to be treated, I shall follow nearly that in which the different parts have been just now mentioned, as it appears to me to be the most simple arrangement, to begin with the parts which first present themselves when we examine the organ in its natural state.

CHAP. I.

GENERAL REMARKS ON THE CORNEA.

THE cornea, in its natural state, possesses properties different from any of those classes of simple textures or membranes, into which anatomists have divided the component parts of organized bodies.

Some have conceived, that, in its structure, it much resembles the nails; but a very superficial examination will be sufficient to shew, that there is little similarity between these two textures. The nails are not, like the cornea, separated by a particular fluid into distinct layers. They are not endowed with an equal degree of sensibility, nor are they liable to all those diseases which occur in the cornea.

Others have attempted to demonstrate, that the cornea is merely a continuation of the sclerotic coat; but the functions and diseases of these two membranes differ so much from each other, that they clearly indicate a difference of structure and qualities. The sclerotic coat exhibits all the properties which fibrous membranes possess. It has a shining, opake, white, colour. It is composed of numerous filaments, running in every direction, which are closely interwoven with one another, and it cannot be divided into layers. The cornea is organized in a manner totally different. It is formed of an indeterminate number of concentric laminæ, which are easily separable from one another, either by the knife, or by maceration. They are, also occasionally separated, in particular diseases, by the effusion of blood or pus. From these circumstances, the cornea may be considered as a membrane *sui generis*.

But, though the cornea possesses properties peculiar to itself, yet it will be found, that the structure, functions, and morbid

changes, of some of the parts of this membrane, have a striking analogy to those of other textures in the animal economy.

Anatomists have shewn, that the external surface of the cornea is a continuation of the tunica conjunctiva; this covering seems referable to that class of membranes which have been denominated *mucous*. It can be separated from the subjacent parts by dissection; it is of a softer texture, and tends more rapidly to putrefaction than the substance of the cornea. It is also nourished by the same vessels which supply the conjunctiva, covering the sclerotic coat, as may be seen when it becomes inflamed.

The internal surface of the cornea is lined by a membrane that forms part of the cavity which contains the aqueous humour, and perhaps it assists in its secretion *. According to the arrangement which I have adopted, it may, with propriety, be considered as a membrane of the *serous* class.

* Tunica humoris aquei.

The substance of the cornea, which is situated between these two membranes, is composed of concentric cellular lamellæ, in the cells of which a peculiar fluid is deposited by the exhalents. This analogy in the two surfaces of the cornea to *mucous* and *serous* membranes, which is observed in the sound eye, is also remarked in the morbid changes of this organ. Some of the diseases to which the cornea is liable, are the same with those which occur in membranes of the serous and mucous textures; and they are accompanied, not only with those symptoms which characterize the diseases of these textures in all other parts of the body, but by a series of phenomena peculiar to the cornea.

In the description of the diseases of the cornea, I shall begin with *inflammation*, as it is the morbid affection which occurs most frequently, and as many of the other diseases to which the cornea is liable, are either preceded or accompanied by one or other of the various modifications of that state.

CHAP. II.

OF THE INFLAMMATION OF THE CORNEA.

THE cornea in the sound eye is perfectly transparent, and none of its vessels admit the red particles of the blood; but, when inflammation takes place, vessels carrying red blood may be distinctly seen ramifying through it, and every change which takes place in the number, in the mode of distribution, or in the colour of the contents of these vessels, may be accurately examined. Besides an increase in the vascularity, inflammation of the cornea is attended with more or less dimness of vision, pain in the eye, in-

tolerance of light, and those symptoms which usually take place when any other part of the organ of vision is inflamed.

The inflammation, however, does not always affect all the textures of which the cornea is composed; and though, in many instances, it may be difficult to discriminate the precise extent of the disease, yet, in others, it may be clearly shown, that the inflammation is entirely confined to one of the textures.

As this distinction involves very important consequences, both in a pathological and practical point of view, we shall consider inflammation of the cornea under three separate heads:

First, As affecting the conjunctiva, which covers the cornea externally.

Secondly, As being confined to the proper substance of the cornea; and,

Thirdly, As affecting the membrane which lines the internal surface of the cornea.

1. *Of the Inflammation of the Conjunctiva covering the Cornea.*

It is by no means unusual to observe, in those who have had long or repeated attacks of inflammation of the conjunctiva covering the sclerotic coat, that a considerable degree of obscurity and vascularity extends from it over the cornea. This took place in many of our troops who suffered from ophthalmia in Egypt, and who have, since their return home, been subject to frequent inflammatory attacks in their eyes. Many cases have also occurred where the same effect was produced by the ophthalmia which has been so frequent among the troops in this country. The obscurity of the cornea, in the cases to which I allude, appeared to be confined to the external surface. Red vessels became ramified upon its surface, and they were much more numerous in proportion to the degree of opacity, than they ever are in the

speck of the cornea. I have observed, in a variety of cases of ophthalmia in this country, where the conjunctiva covering the sclerotic coat was attacked with inflammation, that red vessels branched out from a particular portion of the affected part, and extended a little way over the edge of the cornea; but these vessels generally disappeared when the more violent inflammatory symptoms were removed. In all these cases, however, the inflammation commenced and extended from the conjunctiva, covering the white of the eye, to that part of it which covers the cornea. But in other instances, the inflammation first appears in the conjunctiva, covering the cornea, and is almost entirely confined to it alone. When this takes place, it very much resembles a *speck* on a superficial examination, but the commencement, progress, and final termination of these two diseases are very different. Inflammation of the conjunctiva of the cornea begins at the circumference, and gradually extends from this over the surface of the cornea, whereas a

speck commonly commences at the centre of the cornea, or at some distance from its circumference, and extends in every direction from that point. In the inflammation of the conjunctiva covering the cornea, the opaque part becomes elevated above the natural surface of the cornea, and is highly vascular; whereas, in *speck*, the form of the cornea remains unaltered; and, although one or more vascular trunks advance to the speck, yet the distribution of their branches becomes in general imperceptible.

Inflammation of the conjunctiva of the cornea may also be mistaken for a *pustule* of that membrane; for, in the latter disease, the conjunctiva adjacent to the pustule is sometimes distinctly vascular, and elevated above its natural surface. But if the progress of the two affections be attentively observed, they will be found to be different; for a pustule of the cornea, like a speck, begins at one point, extends from it as a centre, and most frequently terminates in an *ulcer*.

The most remarkable symptom of inflammation of the external covering of the cornea, is the appearance of an elevated and whitish coloured spot or streak, in some point, near the union of the cornea with the sclerotic coat, accompanied by a greater or less degree of inflammation of the adjacent conjunctiva. The blood vessels in the inflamed part are of a bright scarlet colour, run in a straight direction, and are more numerous towards the diseased spot, some of them being ramified through it. This opaque spot gradually extends across the cornea, acquiring, as it proceeds, an oblong form, with a rounded obtuse point. It continues elevated above the natural surface, is distinctly defined, and remains nearly of the same breadth till it reaches the centre of the cornea. If it passes beyond this, it becomes broader, and the breadth increases as it extends, but I have never, in any instance, observed it pass as far as the opposite edge of the cornea. The degree of vascularity also increases in proportion as this spot becomes larger; and if a

magnifying glass be used, the whole of the diseased part will be seen crowded with red vessels*.

When the inflammatory symptoms abate, and the progress of the complaint is checked, the vessels distributed on the diseased portion of conjunctiva acquire a purplish colour, gradually diminish both in size and in number, and run in a tortuous direction; the elevation of the membrane subsides, and if the inflammation has neither been very violent, nor of long duration, its transparency is completely restored. But this is not always the way in which it terminates, as a degree of obscurity sometimes remains after all the inflammatory symptoms and appearances of vascularity have abated. In other instances there is both a slight degree of obscurity, and some red vessels. In one case, where the accompanying inflammation was very violent, the diseased portion of conjunctiva separated completely from the subjacent cornea, came

* Compare fig. 2. Plate I. and fig. 1. Plate II.

off in the form of an opaque slough, leaving a slight degree of obscurity in that part of the cornea over which it was situated.

After the eye has been once affected with this disease, it is very liable to subsequent attacks; and although the cornea regains its transparency, and the red vessels disappear, yet every fresh inflammation is more obstinate than the former, a larger portion of the conjunctiva becomes inflamed, and even after the inflammatory symptoms disappear, the conjunctiva remains interwoven with varicose vessels, flaccid and opaque, having the appearance of a new formed membrane *.

Most of the cases of this disease which I have had an opportunity of observing, were in children. In one instance, however, it occurred in a lady nineteen years old. I have seen another very remarkable example of this disease in a strong healthy man, about thirty-five years of age, under the care of Mr Johnston, surgeon at Kirk-

* Vide Pterygium.

caldy. In this instance it was accompanied with very violent inflammatory symptoms at its commencement; and although the whole of the corneal substance had become cloudy, from the commencement of the disease, yet the patient himself, by examining daily his eye at a glass, gave a very accurate account of the progress of the opacity of the conjunctiva covering the cornea, and described it as beginning at the edge of the cornea, and extending gradually to a little way past its centre. When I saw him, all the inflammatory symptoms had disappeared, the substance of the cornea had regained its transparency, and the affected portion of the corneal conjunctiva remained thickened, of a brownish colour, and interwoven with blood vessels, the trunks of which were formed into a cluster, at the union of the cornea with the sclerotic coat.

2. *Of the Inflammation of the Proper Substance of the Cornea.*

If the whole of the proper substance of the cornea be inflamed, the red vessels enter at every part of its circumference. They are always most numerous at the margin, and few of them advance to the centre. I have seen them so numerous, as to form a red band or ring round the outer edge, leaving the central part transparent. If the inflammation be confined to one spot, the red vessels appear in clusters on the adjacent portions, both of the cornea and sclerotic coat.

From the commencement of the inflammation, the cornea loses its transparency and lustre, and becomes so dim and clouded, as greatly to interrupt vision. There is either an equal degree of obscurity over the whole cornea, or one part is more opaque than another; but the degree of it is, in general, proportioned to the severity of the other symp-

toms. When the inflammation is extremely violent, I have seen small vesicles, filled with red blood, formed between the layers of the cornea; and in some cases, blood effused into the aqueous humour, tinging it of a red colour. In the first, or active stage of the inflammation, the blood-vessels on the sclerotic coat are of a bright scarlet colour. They run in a very straight direction, and pass over the edge of the cornea. Each trunk can be readily distinguished, and the branches into which it is divided come off at very acute angles, and not until the trunk reaches the circumference of the cornea.

Inflammation of the cornea is also accompanied by more or less general fever, pain in the eye, extending to the head, intolerance of light, increased secretion of tears, and impaired vision.

Although inflammation may originate in the cornea, it is always accompanied with a preternatural degree of redness of the sclerotic coat; and it is often impossible to determine whether the cornea or sclerotic coat is pri-

marily affected. In cases where the cornea is wounded, it cannot be doubted, that the inflammation originates in the wounded part, however far it may afterwards extend; but, in many instances, both the cornea and sclerotic coat seem to have an equal share in the disease. It is probable that this ready communication of the diseased action between these two coats, depends chiefly on their vascular connection; for the vessels of the substance of the cornea are all derived from the sclerotic coat, and, as has been before mentioned, those of the conjunctiva covering the cornea, are continuations of the vessels of the conjunctiva covering the sclerotic coat.

The symptoms of inflammation of the cornea generally suffer, whether by the application of remedies, or from the progress of the disease, a very remarkable change after a certain period. The red vessels of the sclerotic coat and cornea, increase in size and in number, change in colour, and are distri-

buted in a different manner. Instead of running in straight lines, and sending off their branches at acute angles, they become tortuous, anastomose, and form net-works. The bright colour changes into a darker and more purple hue, and the eye appears as if glazed, losing all its lustre and expression. The pain, too, and general fever, which were severe, are now alleviated, or cease altogether, and the free admission of light is not attended with much uneasiness. If the inflammation has been occasioned by an wound, such as that which is made in the extraction of the cataract, this change takes place generally several days after the operation. The change approaches more slowly in those cases where the inflammation arises from other causes, and rarely happens till after a period of some weeks, or even months, from its commencement. In many cases, indeed, no such distinction can be made, as, throughout the whole progress of the disease, there is a constant change taking place in the abatement or increase of all the symptoms.

I have seen a few cases where there were a number of varicose vessels in the cornea, in consequence of previous inflammation; and the patients, in describing the state of their vision, said they saw small lines, or streaks, passing across the eye, which they sometimes observed to vary in their size, and to have a kind of irregular vermicular motion, such as the blood-vessels in the cornea may be supposed to have.

If an attempt be made to divide the enlarged vessels as they pass over the cornea, (a practice recommended in the treatment of the disease), they are found to lie deep, and they cannot be so easily raised from the cornea or sclerotic coat with the forceps, or elevated by a pointed instrument, as may be done in the natural state of these parts. In order to complete the division of one of these vessels, it becomes necessary to remove a considerable portion of the substance of the cornea, or sclerotic coat. Soon after such an operation has been performed, lymph is effused on the surface of the wound; and it

often happens, that vessels shoot through this lymph, forming a medium of communication between the divided extremities; so that, after the effects of the operation seem to have abated, the vessel remains in one continued trunk, and appears as if no division had been made. In other cases, the minute ramifications of the divided vessel which remain, anastomose on the cornea, so that red blood continues to be circulated through the trunk.

Inflammation of the cornea occurs at every period of life, and, like other inflammatory affections, is most frequent among the young and plethoric. It most frequently arises from wounds and other external causes; but the cornea is also often inflamed in cases of ophthalmia arising from lues venerea, small-pox, scrophula, and various eruptive diseases; the inflammation being, in all those cases, modified according to the specific causes from which it originated.

Inflammation of the cornea, when proper means are employed for its removal, most

frequently terminates by the disappearance of all its symptoms. Sometimes, however, during the progress of the violent inflammation, purulent matter is formed between the lamellæ of the cornea, which, by ulceration, either discharges itself internally into the anterior chamber, or externally, leaving an ulcer of the cornea. More frequently, after all the inflammatory symptoms have disappeared, a part of the cornea does not regain its natural transparency, so that a *speck* remains, which continues to be nourished by a number of red vessels.

3. *Of the Inflammation of the Membrane which lines the Internal Surface of the Cornea.*

Although, from analogy, it is highly probable that the membrane which lines the internal surface of the cornea may become inflamed, and the inflammation neither affect the proper substance of the cornea, nor its external covering, yet I have never been

able to observe an instance with sufficient accuracy where this took place. In cases of ophthalmia from lues venerea, there is often a peculiar muddiness of the cornea, apparently deep seated, followed by the effusion of lymph between the cornea and iris; and it is by no means improbable that, in these cases, the lymph has been effused, and the opacity of the cornea produced by the inflammation of its internal layer. I have also frequently observed cases where the iris and internal surface of the cornea had formed adhesions, in which the substance of the cornea did not appear to have been inflamed. The inflammation, or at least some of the morbid changes of the internal layer, may also be concerned in the cases where the quantity of the aqueous humour is either increased or diminished; and it must often participate in the inflammation which originates in the proper substance, or in the external covering of the cornea.

CHAP. III.

OF THE PTERYGIUM.

THE word *Pterygium** is employed to denote all those morbid changes, in which that portion of the conjunctiva covering any part of the cornea or sclerotic coat becomes thickened, vascular, and opaque; and some authors have attempted to introduce a number of terms to characterise the numerous varieties of the disease, considering each as a distinct species†.

* Das Augenfell of the Germans,—L'Ongle of the French.

† See Traité sur les Maladies de l'Oeil, par Antoine Maitre-Jan.—Also Anfangsgründe der Wundarzneykunst, von August. Gottlieb Richter. Dritter Band.

It has been already mentioned, that inflammation may be confined to the conjunctiva covering the cornea. If this inflammation continues for a long time, or if there are repeated attacks of it, the affected portion of conjunctiva assumes the appearances of a new formed membrane, even after all the inflammatory symptoms have abated. This new formed membrane constitutes what has commonly been denominated the membranous pterygium, or *pannus* *.

It also sometimes happens, that the portion of the conjunctiva which covers the sclerotic coat, becomes preternaturally thick, and the cellular membrane which connects the thickened part of it with the sclerotic coat, is so much relaxed, that it may be very easily moved backwards and forwards; and when the eye-ball is placed in particular positions, it forms itself into folds, and becomes as if wrinkled. This thickening and relaxation of the conjunctiva extends, in some cases,

* Pterygium tenue, Ungula, l'Onglet, see Plate III. fig. 1.

round the whole circumference of the white of the eye*, in others, it is confined to a small part of it.

In the first case, the disease has the appearance of a dull white-coloured fold, all round the edge of the cornea, and the eye loses its shining appearance and lustre, and becomes of a yellowish colour. When the disease increases, the fold gradually extends over the cornea, approaching towards the centre.

If the disease be confined to a particular part of the conjunctiva, it is observed, at its commencement, like a small globule of fat†, or condensed cellular substance, situated near the junction of the cornea and sclerotic coat; and this spot, extending imperceptibly along the surface of the conjunctiva, at length passes over the cornea. After it has extended a little way, the conjunctiva on the adjoining part of the sclerotic coat becomes puckered, and appears

* See Richter's Anfangsgründe.

† Das Fettfell of the Germans,—Pterygium pingue.

as if it were drawn forcibly over the cornea. The portion of it which lies on the sclerotica is commonly loose, and can be easily elevated; but that which is on the cornea adheres more firmly. This species of pterygium has generally a triangular form *, one of the angles of the triangle either advancing towards the cornea, or covering it, and the base lying on the sclerotic coat. Sometimes the thickening of the conjunctiva is first perceived on the cornea, the conjunctiva covering the sclerotica remaining quite sound †. A pterygium is always considerably elevated above the surface of the adjacent cornea, but the degree of its thickness varies from that of a thin membranous film to a thick fleshy mass ‡. In some cases it has been found thick and coriaceous, and in others as hard as parchment, and even cartilaginous §. The cellular substance under

* See Plate III. fig. 2.

† Vide Richter's Anfangsgründe.

‡ See Plate III. fig. 1, 2, and 3.

§ Vide Richter's Anfangsgründe.

the conjunctiva sometimes participates in this disease; in other instances it does not seem to be affected.

In those pterygia which have a membranous-like appearance, the red vessels are generally few in number, and run in straight lines from the sclerotic coat towards the centre of the cornea. In those which are thicker, and which have a fleshy appearance, there is a general red tinge given, from the vessels being very numerous.

Pterygia arise commonly at the great or nasal angle of the eye-ball; they are formed also at the small or temporal angle, and they sometimes occur in both places, in the same eye *. I have seen one case in which there were two pterygia on each eye. They are formed very rarely on the under part of the eye-ball.

This disease seldom extends farther than the centre of the cornea, when it begins in

* Vide Traitè Pratique des Maladies des Yeux, par A. Scarpa, fig. 3. Plate IV.

a single point. But when two pterygia arise from two opposite points of the same eye, they sometimes spread over the cornea till they nearly meet, and then form a complete obstruction to vision; the imperfection of vision in this disease being in proportion to the thickness of the pterygium, and to its approximation to the pupil.

When pterygium arises in the nasal angle of the eye, it seems almost always to attach itself to the semilunar membrane, and in many cases it also adheres to, and involves the caruncula lacrymalis.

Pterygia occur most frequently in people advanced in life. They are, however, also met with in children: And I have seen one instance in which the disease was observed immediately after birth.

Many have supposed that the pterygium was a particular kind of expansion or growth from the caruncula lacrymalis, or from the semilunar membrane; but from the variety in its appearances, and from observations on the progress of the disease, it would seem that

its connection with these parts is accidental; and that pterygia arise from a variety of causes, some of which we are, perhaps, not able satisfactorily to explain. It has been already mentioned, that the thin membranous pterygium is the consequence of repeated attacks of inflammation of the conjunctiva covering the cornea. The manner in which the common triangular-shaped pterygium is formed is much more singular, and appears to have no analogy to any morbid change in other organs which have a similar structure. The constancy in the regularity of its triangular form ought to be referred, says Scarpa, the celebrated Professor of Pavia, to the adhesion of the lamina of the conjunctiva covering the cornea becoming stronger, in proportion as it advances from the circumference to the centre of the cornea; for, in consequence of such structure, and different degree of cohesion which exists in the sound eye, it should necessarily follow, that, in the *first* place, the progress of the pterygium ought to be, in every case

of the disease, much slower upon the cornea than upon the white of the eye; *secondly*, that, from the greater resistance which the pterygium always meets with in proportion as it extends towards the centre of the cornea, it ought, from mechanical necessity, to assume a triangular form, the base of the triangle corresponding to the white of the eye, and the apex to the centre of the cornea. Its progress is, in almost every case, very slow; it arises without any evident cause, and gradually increases, without pain or inconvenience, until it acquires a considerable bulk, and encroaches on the sphere of the pupil. In many instances, it remains for years without undergoing any perceptible alteration.

CHAP. IV.

OF FLESHY EXCRESCENCES OF THE CORNEA.

BESIDES pterygia there are excrescences of a different description, which are called *Caruncles* *, or fleshy excrescences of the cornea. Of these there are two very distinct kinds. One of them appears at birth, or soon after it, and resembles the nævi materni so frequent on the skin of various parts of the body. The second species has a greater analogy to the fungi which grow from mucous surfaces, and they arise commonly from previous ulceration.

* Carunculæ Corniæ,—Excroissances des Chairs, of the French,—Fleishgewächses of the Germans.

I have had an opportunity of examining two very remarkable examples of tumours of the cornea, which appeared at birth. The first was that of a girl of eight or ten years of age, on whose left eye there was a conical shaped mass, the base of which grew from about two thirds of the cornea, and a small portion of the adjoining sclerotic coat. It was firm and immoveable, had a rough granulated appearance externally, and, from its brownish colour, did not appear to be very vascular. It was very small when it was first observed, and it increased in size in proportion with the other parts of the body.

The second case I saw along with Dr Monro, junior. The patient was upwards of fifty years old, and the tumour had been observed from birth. It was about the bulk of a horse bean, and only a small portion of it adhered, and seemed to grow from the cornea; the other part was situated on the white of the eye, next the temporal angle of the orbit. Its surface had not the particular appearance which was in the girl's eye; it

was smooth like a pterygium, and seemed to be covered by the conjunctiva, having the natural colour of that membrane. But the singularity in this case was, that a considerable number of very long and strong hairs, upwards of twelve in number, grew from the middle part of it, passed through between the eye-lids, and hung over the cheek. The patient remarked that these hairs did not appear until he advanced to his sixteenth year, at which time also his beard grew*.

Dr Barron of St Andrews met with a similar case when at Lisbon, with the following account of which he has favoured me: "The disease took place in a boy of fifteen "years of age. It was a flat tumour, about "one-third of an inch in diameter, with a "perfectly circular base. More than one half "of it was situated on the cornea, and the "rest on the conjunctiva, adjoining to the "temporal angle of the orbit. Its surface "was smooth and shining, and from its

* See Plate IV. fig. 1.

" centre grew two hairs, similar to those in " the tarsus of the upper eye-lid. In colour " it resembled the white part of the conjunc- " tiva. It was, however, rather more of a " pink hue. The disease was of five years " duration, and it was, at times, accompanied " with excessive pains above the orbit, and " in the temple of the side affected."

Mr Crampton of Dublin, in his Essay on the Entropeon, p. 7. also mentions, that he once saw "a tuft of very strong hairs proceeding from the sclerotica;" and De Gazelles saw a case where there was a single hair growing from the cornea*.

I have in my possession, a preparation of a disease of this kind in an ox's eye, where a thick tuft of black hair grows out from and covers about one-third of the cornea, and some hairs are also observed growing from the semilunar membrane. A similar excres-

* See Journal de Medecine, tom. xxiv.

cence had formed in the other eye of this animal.

Such tumours greatly resemble those spots covered with hairs, which are so frequent in different parts of the surface of the body, particularly the face. I remember to have seen the description of a very curious case of a child, where a tumour, covered with hair, appeared in the pharynx.

A fungous tumour, arising from the surface of an ulcer on the cornea, is a rare disease. It, however, frequently happens, that an ulcer destroys the whole thickness of the cornea, allowing a portion of the iris to protrude, and the protruded portion has, in many cases, been the origin of large excrescences. The following case is a remarkable example: "The largest excrescence I ever saw," says Maitre-Jan *, "arose from an ulcer which occupied partly the opaque, and partly the transparent cornea. It was so large as to advance beyond the eye-lids,

* Traité des Maladies des Yeux.

like a mushroom, and cover the whole eye-ball." After mentioning the means employed to remove it, he adds, "that when the excrescence was consumed to the level of the cornea, I then observed, that its base only occupied one half of the small angle; that the cornea was ulcerated and broken; and that the roots of the excrescence passed from thence, and had their attachment to the uvea." Voigtel * quotes the case of a boy from Mohrenheim, in whom, after a violent inflammation of the eye, a small white point appeared on the inferior part of the cornea, which gradually grew into a hard cartilaginous tumour, of the bulk of a pea. Its base covered one half of the cornea, and its surface was interwoven with large blood vessels. Beer † describes a fatty and fleshy swelling of the cornea

* See Handbuch der pathologischen Anatomie, von F. G. Voigtel. Halle, 1804.

† Practische Beobachtungen über den grauen Staar und die Krankhieten der Hornhaut, von Joseph Beer. Vienna, 1791.

which was as large as a cherry-stone; and Plaichner * relates a case, where a spongy tumour, the size of a hen's egg, grew from the cornea, after the removal of a fleshy swelling.

* Dissertatio de Fungo Oculi, 1780.

CHAP. V.

OF PUSTULES OF THE CORNEA *.

PUSTULES are small tumours, which are formed both on the cornea and sclerotic coat, but they occur most frequently near the junction of these membranes.

A pustule of the cornea commonly first appears like a dusky, yellow, or reddish spot, a little elevated above the surface of the cor-

* They are called Pustulæ Corneæ—Eiterblattern by the Germans, when they contain matter. Phlyctenæ Corniæ,—Phlyctides,—Wasserblattern, when they contain water.

nea, and, in a short time, it becomes a distinct conical tumour. The adjacent part of the cornea is always more or less dim, and a considerable degree of inflammation * accompanies it, which is either confined to the white of the eye contiguous to the pustule, or is spread over the whole eye-ball. Whilst the pustule is forming, the inflammation is generally confined to that part of the white of the eye which is in its immediate vicinity. The vessels, instead of being of a bright scarlet colour, as in the inflamed cornea, are of a pale livid hue. They appear superficial, and can be readily elevated by a pointed instrument. Each trunk can be distinguished, for they are never so numerous as to appear confused, or like one red mass, an appearance so common when a portion of the conjunctiva is inflamed †.

They sometimes run in various directions, anastomose freely with one another, forming net-works on the white of the eye.

* Ophthalmia Pustulosa, or Catarrhalis.

† See Plate I. fig. 3.

If the inflammation and pustule remain for some time, the pustule generally advances to suppuration. When suppuration takes place, the apex of the pustule ulcerates, and frequently a chalky white spot appears at the centre of the ulceration, and the opacity of the cornea at the same time daily increases around it. In other cases the opaque matter separates, and leaves behind it a deep ulcerous excavation *.

Sometimes the suppuration proceeds more like a common pimple or *phlegmon* of the skin; a small quantity of a thick matter collects within the pustule, and when it is discharged, a conical tumour remains, which has a depression at the apex. When the pustule contains a watery fluid, the fluid is most frequently absorbed in a gradual manner, but at other times the pustule breaks, and an ulcer is formed.

If, in either of these cases, the contents of the pustule are artificially discharged, all

* See Ulcer of the Cornea.

the accompanying inflammatory symptoms are much increased *.

Most frequently there is only one pustule, and only one eye affected, but in some cases there are several, both on the cornea and sclerotic coat of each eye.

The disease, at its commencement, is almost invariably accompanied with the sensation of a mote in the eye, and the whole conjunctiva covering the sclerotic coat has often a yellowish and shining glassy colour before the redness appears. There is often also a degree of redness and swelling, chiefly of the upper eye-lid, and the tarsi are found adhering together in the morning from the exudation of a yellow matter among the ciliæ. There is frequently an unusual dryness felt in the eye; but if it is exposed to a bright light, or if any attempt is made to use it, the secretion of tears is increased.

This species of inflammation is always accompanied with a much greater degree of

* Vide Richter's Anfangsgründe.

general fever, in proportion to the severity of the other symptoms, than any other ophthalmia. The pain is rarely acute till the pustule ulcerates, but, if that takes place, it is commonly very severe.

As the pustule disappears, and the subsequent ulcer heals, the inflammatory symptoms generally abate. It is not, however, unfrequent to find, that although this has taken place, the inflammation returns on any slight irritation; and I know several instances of people who are very subject to repeated attacks of this disease. In some of the cases where it returns frequently, the pustule seldom ulcerates, but disappears gradually, after having remained a few days. In one case, after a second attack of the inflammation, a quantity of a yellow lymph was effused near the margin of the cornea; and I have seen two instances where a small quantity of purulent matter formed in the anterior chamber. It was readily distinguished by its yellow colour at the inferior

margin of the cornea, and it diminished daily as the inflammation abated.

Pustules of the cornea are met with in people of all ages, but they are more common in the young than in those advanced in life. This disease appears to be more frequent in particular places, and in particular seasons of the year. In Edinburgh, where it is not a very frequent complaint, I have generally observed it in the winter months.

During the winter of 1804, I saw a great number of patients with this disease in the clinical school of Dr Beer, at Vienna, for diseases of the eyes; and in all of them it was accompanied with such a degree of fever, as to require attention almost solely to the general treatment. I have, in several cases, been able to trace its origin to the sudden change from a very warm to a cold atmosphere. At one of the theatres of Vienna, where a very cold stream of air passed immediately behind the orchestra, it was observed that those people who were placed

near it were very often affected with this complaint.

It appears to me highly probable that the pustules of the cornea, and white of the eye, very much resemble the small pustules, or *aphthæ*, as they are called, which are so frequently observed in the cavity of the mouth, on the tongue, lips, and on the internal surface of the alimentary canal. Although these aphthæ may be, perhaps, considered as a morbid change of the mucous membranes, yet the phenomena attending the disease are very different from those which are observed in the common inflammation of a mucous surface. From the swelling which takes place, and from the tendency of this swelling to suppuration, there appears to me to be a striking analogy between this inflammation and inflammation in the cellular membrane in other parts of the body, or the common *phlegmon*. It is, therefore, by no means improbable that pustules are formed in the cellular texture, which enters into the composition, or which lies immediately

underneath the conjunctiva which covers the eye-ball.

As some remarks of Professor Himly of Brunswick illustrate very strikingly this analogy, I shall finish this description by quoting his words: "At a time," says he, "when aphthæ of the throat were very frequent at this place, I also found many small vesicles, beginning with an inflammation of the sclerotic coat, and also sometimes, but more rarely, of the cornea. Once I saw a whole family affected with this disease, one after another. It was a true catarrhal affection, and in some cases these vesicles disappeared by diaphoretic medicines, in some by blisters, camphor, and antimony, without any local application, except mucilaginous ones. I think that it is just the same disease as aphthæ of the intestinal canal, of the corona of the glans penis, and other fine continuations of the external skin. Those on the cornea become worse if they are opened; and if they open themselves, and form ulcers, they generally dry up by means of borax and white vitriol, but

if they are neglected, they cause sometimes considerable ulcers, which are very obstinate and hurtful to the cornea *."

* Vide Bemerkungen über einige Augenkrankheiten, von Professor Himly zu Braunschweig, p. 402. of the 1st volume of Loder's Journal.

CHAP. VI.

OF THE ABSCESS OF THE CORNEA AND ANTERIOR CHAMBER.

PURULENT matter may be collected either between the lamellæ of the cornea, when the disease is termed *unguis* or *onyx*, or in the anterior chamber, along with the aqueous humour, when it gets the name of *hypopion* or *empyesis oculi* *.

When the matter is collected between the lamellæ of the cornea, it first appears like a small spot; and instead of resembling a *speck* in colour, it is of the yellow hue of common pus. As the quantity of the matter increases, this spot becomes broader, and it

* Die Eyterung des Auges, or Der Hornhaut Apostem of the Germans.

does not alter its situation from the position of the head. If it is situated among the external layers of the cornea, or immediately below the corneal conjunctiva, a tumour is formed anteriorly, which, if touched with the point of a probe, the contained fluid can be felt fluctuating within it, or if the eye is looked at side-ways, there is readily perceived an alteration in the form of the cornea.

When the matter collects between the interior lamellæ, it does not produce any evident alteration in the external form of the cornea, but if it is touched with the point of a probe, a fluctuation can be more or less distinctly perceived, and the spot alters its form, and becomes somewhat broader.

Such collections of matter appear on every part of the cornea. Sometimes they alter their situation by degrees, and sink downwards; and sometimes they change both their situation and form. They very seldom cover more than one-fourth or one-third of the cornea; but, in one instance, I saw the

matter so extensive, as to be spread over nearly the whole corneal surface.

If the quantity of matter is small, it is often completely absorbed during the abatement of the inflammatory symptoms, and it generally leaves no vestige behind it: In other cases, the cornea is eroded externally, producing an ulcer and subsequent opacity *. In some few instances, the internal lamellæ of the cornea give way, and the matter escapes into the anterior chamber. If an artificial opening is made, in order to discharge the matter, it often does not flow out readily; and it is sometimes so tenacious, and contained in a cavity apparently so irregular, that it neither escapes spontaneously, nor can it be evacuated by art.

When the matter is collected in the anterior chamber, it generally appears like a small yellow globule between the iris and cornea; and as its specific gravity is greater than that of the aqueous humour, it generally

* Vide Ulcer of the Cornea.

occupies the inferior part of the cavity *. In some cases I have observed the matter appearing like small opaque flocculi diffused through the aqueous humour, and these, by gradually uniting together, formed a drop of purulent matter, which sunk to the inferior part of the cornea. As the quantity of matter increases, the spot becomes larger, and often assumes a semilunar form at the edge of the cornea; sometimes it collects in such a large quantity as to pass through the pupil, and fall behind the iris. When this happens, the cornea not only becomes opaque, but also loses all its natural firmness of texture; and in some very far advanced cases of the disease, when attempting to discharge the matter, I have found it quite soft, and easily torn to pieces.

Unless when in great quantity, the matter is generally absorbed in proportion as the inflammatory symptoms are alleviated; but if it remains a long time, it sometimes

* Richter's Anfangsgründe.

ulcerates the cornea, or becomes inspissated into a tough, light-coloured mass, which remains after all the inflammatory symptoms have disappeared.

Schiegel mentions a case of abscess of the anterior chamber, in which the pores of the cornea were so open that the matter oozed out in the form of threads. The following are his words, "By the application of the decoction * in a case of hypopion, the matter discharged itself in an uncommon manner. Whilst using it, the fine pores of the cornea were opened, and the matter oozed out in the form of fine threads. On the second day the distended cornea was considerably flatter, the oozing out of the matter continued without interruption, and in four days nearly two drams of matter had passed through the pores †."

These abscesses are commonly the effect of violent ophthalmia, occasioned by blows,

* Decoct. Fol. Malvæ cum Opio.

† Vide Magazin für die Wundarzneiwissenschaft herausgegeben, von J. Arneman, 2d Band. 2d Stück.

or injuries of the eye-ball. Richter, however, remarks, that purulent matter sometimes collects in venereal and scrophulous patients, without any preceding inflammatory symptoms. Dr Rutherford mentioned to me the case of a woman who was under his care in the Royal Infirmary of Edinburgh, who had a very considerable collection of matter in the anterior chamber, accompanied with very little or no inflammation. The matter altered its form and place, according to the position of the head, and, during the day, the agitation of the body, produced from walking, mixed the matter with the aqueous humour, and rendered the whole anterior chamber turbid. Janin relates a very curious case, where there was not only the absence of the inflammatory symptoms, but where the disease recurred periodically. "About the beginning of the month of March 1757," says he, "Peter Valis consulted me about a periodical blindness with which he had been affected for twelve months, during the first fifteen days of every month; and, after

that time had elapsed, his eyes were restored to their natural state. I examined the organ, in order to ascertain the cause of that singular kind of blindness, and I observed that the anterior chamber of both eyes was filled with a yellow-coloured matter, so thick as neither to allow the colour of the iris, nor the state of the pupil to be seen through it. The most remarkable circumstance in this case was, that the conjunctiva was very little inflamed, and the eye not painful *."

Richter saw a man who was blind every morning, and it was always remarked that, while the paroxysm lasted, the aqueous humour was quite turbid.

It has been a subject of dispute, to account for the source of the matter which is formed in hypopion. It appears most probable, that as there is no ulcerated surface from which it can be derived, it is the produce of some secreting organ. There are

* Vide Memoires sur l'Oeil, par Janin, p. 412.

numerous examples of the natural secretion of surfaces being altered by diseases. It is very remarkable in the mucous membranes, and in those of the serous class, to which the membrane which contains and secrets the aqueous humour belongs. When they are inflamed, it is a very common morbid appearance to observe their surfaces covered with a matter, varying from the consistence of a thick coagulated lymph to that of a thin yellow puriform fluid.

CHAP. VII.

OF ULCERS OF THE CORNEA*.

Ulcers in the cornea have been divided by some authors into a number of species, from differences in their size, in their duration, in the degree of the severity of the accompanying symptoms, and from the various causes from which they have been supposed to originate. But as these divisions are not founded on any specific differences in the nature of the disease, and as, instead of elucidating the subject, and assisting us in our inquiries, they lead to erroneous conclusions, and ren-

* Helcoma.—Das Geschwüre der Hornhaut of the Germans.

der more complex a subject in itself simple, I shall omit mentioning them, referring those who wish for information on the subject to the works of Wallis *, Maitre-Jan, Mauchart †, and Rowley ‡.

The most frequent variety of ulcer of the cornea is that which remains after the cornea has suppurated and burst, either in consequence of a pustule or of an abscess. When a pustule suppurates, the central part of it generally first gives way, and, as the disease continues, the ulceration extends in all directions from that point. Ulcers of this kind are generally circular, and the edges rounded and smooth, having sometimes the appearance of a small artificial dimple §; in other instances, they have an irregular shape, and

* A Treatise on the Diseases of the Eye, by George Wallis, M. D. 1785.

† Burcard, David Mauchart, *de ulceribus corneæ*. Tubingæ, 1742.

‡ A Treatise on the Diseases of the Eye and Eyelids, by William Rowley, M. D. 1790.

§ See Plate IV. fig. 3.

their edges are more jagged and acute. Their size is very various; in some cases they do not appear larger than a depression made by the point of a pin; whilst in others they cover a much larger portion of the cornea. It seldom, however, happens that they spread over a large surface, for those of the most malignant kind are more apt to increase in depth than in breadth. They are generally superficial, and do not extend deeper than the external lamellæ; at other times, they penetrate the whole thickness of the cornea, and allow the aqueous humour to escape. Most frequently the part of the cornea contiguous to the ulcer becomes more or less obscure; and in some cases red vessels may be also traced in it. It is not unusual, however, to observe a small ulcer without any perceptible obscurity of the cornea.

The surface of the ulcer sometimes retains the natural transparency of the cornea; in some cases the whole, or a part of the surface of the ulcer, is covered with an opaque white

matter, much resembling wet chalk*; and in others, where the ulceration spreads with great rapidity, the cornea loses not only its transparency, but its tenacity and firmness, and becomes like a piece of wet pasteboard, separating in the form of sloughs.

When the aqueous humour is discharged, from the whole thickness of the cornea having been destroyed, it often happens that the iris falls forwards, and a fold of it is insinuated through the opening in the cornea made by the ulcer. If the ulcer heals speedily, and the aqueous humour is regenerated, the iris sometimes resumes its natural situation; but more frequently an adhesion takes place between it and the cornea, so that ever afterwards the pupil remains drawn from its natural situation, and of an irregular form.—Sometimes the ulcer is long in healing, so that the aqueous humour continues constantly to ooze through it, and a *fistula* of the cornea is formed. In cases where a very great

* See Plate II. fig. 2.

portion of the cornea is destroyed, not only the aqueous humour, but also the vitreous humour and crystalline lens make their escape, completely destroying the whole eye-ball. A woman, in whom, by a violent attack of inflammation, the cornea was destroyed and came off in large sloughs, a transparent tumour was formed by a prolapsus of the vitreous humour through the opening of the cornea; by which means she was enabled to see with considerable distinctness for several days, until the vitreous humour began to be absorbed, and the eye-ball to collapse. A case very similar to this was, some time ago, under Mr Thomson's care in the Royal Infirmary of Edinburgh. A man had a cancerous sore on the under eye-lid, which, in spreading, inflamed the eye-ball, and ulcerated nearly the whole cornea. Through this ulcer a portion of vitreous humour was pushed, forming a large transparent tumour, which enabled him, for several days, to distinguish minute objects with tolerable distinctness.

Ulcers often take place from the formation of abscesses, or collections of purulent matter betwixt the layers of the cornea. When the contained matter is evacuated by that part of the cornea being destroyed which formed its external covering, the ulcer which is produced has, like those already described, sometimes a colourless surface; at other times it is covered with an opake white matter, and it is subject to the same variations in form, size, depth, &c.

Ulcers sometimes, but very rarely, take place after wounds of the cornea.

They are seldom accompanied with much swelling of the cornea, except in children, in whom I have sometimes observed the cornea all round the ulcer considerably tumefied*.

They are generally accompanied with acute pain, which is much aggravated by exposure to light, or even by the most careful motion of the eye-lids. I recollect having seen only one instance, of an ulcer of

* See Plate IV. fig. 3.

considerable size and depth, attended with little pain or uneasiness.

Ulcers, such as have been described, have a striking analogy to those which form on mucous surfaces, or on those parts of the body where the skin is very thin and inflected inwards *, as on the mouth, lips, internal surface of the nose, tip of the tongue, &c. The pustules or aphthæ † which precede them, have the same tendency to ulcerate rather than to form matter; they discharge an acrid serum instead of pus; they spread rapidly, and are also attended with acute pain.

Ulcers are also formed in consequence of the action of corrosive substances destroying the vitality of the cornea, and producing an ulcer where the dead portion separates from the living. Lime getting into the eyes is the most frequent accident which produces this effect; but the application of the nitrate of silver, muriate of antimony, &c. produces

* Vide Scarpa Traité sur les Maladies des Yeux.

† See Pustules of the Cornea.

one nearly similar. When lime falls within the eye-lids, those parts of the surface of the cornea to which it has been applied, become covered with an opaque white scale, accompanied by inflammation over all the external parts of the eye-ball and lids*; but the degree of thickness of the slough and violence of the inflammatory symptoms vary, according to the quantity of the lime, and the length of time it has been applied.

The circumstances attending this accident are strikingly illustrated in the case from which the drawing of fig. 3. Plate II. was taken. Nearly the whole external lamellæ of the cornea was destroyed from the application of the lime; and, from the small share of sensibility which the cornea possesses in its healthy state, the process of separation of the dead parts went on very slowly, and lasted several months.

After the violent inflammatory symptoms were subdued, the chalky matter began to

* See Plate II. fig. 3.

separate at the union of the cornea with the sclerotic coat, and numerous small red vessels were seen at the place where the separation was going on. The process of separation proceeded from the circumference to the centre of the cornea—small flakes of the white matter could be daily observed to be coming away; and, after the lapse of several months, the whole disappeared, and the cornea regained nearly its natural transparency.

The healing process of ulcers shows that the cornea, like most other textures of the body, is capable of cicatrization. In most cases, this process seems to advance little farther after the principal part of the cavity of the ulcer is filled up, and a plain surface formed; so that, even after all the symptoms of disease have abated, a small dimple or inequality of the cornea remains. If the ulcer has been small or superficial, the depression is almost imperceptible; but when it has been of considerable size, the inequality of surface is distinct, and if it is situated opposite to the

pupil, it is very apt to render vision obscure. The portion of cicatrized cornea, it ought to be remarked, is not only unequal, but is by no means in all cases transparent, for it often happens, that an ulcer leaves a *speck* of the most opaque and incurable kind.

CHAP. VIII.

OF WOUNDS OF THE CORNEA.

WOUNDS of the cornea unite readily, and often without leaving the least trace of any cicatrix behind them. When the wound heals by adhesion, a slight opacity only remains, and commonly there is nothing to be observed but a little elevation or inequality of the edges, which, in many cases, arises chiefly from the lips of the wound not being adjusted with sufficient accuracy at the time the wound was made. When all inflammation has abated, and a few months elapsed, the cicatrix appears like a hair sticking on the cornea; and even this can only be dis-

tinguished in certain lights by an attentive eye.

When a wound of the cornea, in place of healing by adhesion, goes through the more tedious process of suppuration, a considerable time elapses before the parts resume their natural form; and there always remains an obscurity, extending from the divided edges over more or less of the adjacent cornea.—When the suppuration commences, the edges of the wound swell, and are separated from one another, to a considerable distance, by a yellow, tough matter, resembling lymph, which sometimes hangs down from the wound in the form of flakes. As the healing process goes on, the quantity of this matter diminishes, and the edges gradually approach each other, until a firm and complete cicatrix is formed. It is generally several weeks before this process is completed, supposing every thing to go on uninterrupted; but it often happens that, when wounds are accidentally inflicted, or even in the incision of the cornea, made in the operation of extracting the crystalline lens, a

portion of the iris falls forwards, and either adheres to the edges of the wound, or passes completely through it. This last accident is always attended with disagreeable effects; for, besides the permanent defect in the form of the pupil, and the distressing symptoms of pain and inflammation, which the strangulation of a portion of the iris never fails to produce, the lips of the wound are seldom allowed to close altogether, so that the aqueous humour drills out, until a very tedious process of cicatrisation is completed.

In most cases of wounds of the cornea, the opacity does not extend far beyond the edges of the wound, except in those cases where the inflammation has been long protracted. It seems to be confined to the cut surfaces; and in the incision made for the extraction of the cataract, where the knife runs between the layers of the cornea for a considerable extent, and does not make an incision perpendicular to the plane of the spherical surface, the remaining opacity is of a very considerable breadth, pointing out the precise form of the incision.

CHAP. IX.

OF FOREIGN BODIES ADHERING TO THE CORNEA.

When a foreign body once adheres to the cornea, all attempts in rubbing the eye-lids, or winking and shutting them forcibly, tend more to imbed it firmer, rather than to remove it. From the external layer of the cornea being soft and yielding, the foreign body, if it be small, soon forms to itself a seat, and the constant flow of tears and disposition to shut the eye-lids, produced by its irritation, soon bring on a violent inflammation, which never abates, until the body is either removed by art, or comes away by a tedious process of suppuration.

When the foreign body is removed by art, it leaves behind it a depression, which is often discoloured; the colouring matter, however, is soon absorbed, and the depression is generally filled up, and all surrounding opacity removed in a few weeks.

In a very few hours after a foreign body adheres to the cornea, the adjacent portion of cornea becomes opaque, and the opacity extends according to the violence of the inflammatory symptoms, which the irritation of the new substance creates. I have observed this opacity form very rapidly, and to a great extent, in the eyes of animals, from a similar cause; but in animals, opacities are more rapidly formed, and are more speedily removed.

Sometimes a foreign body remains imbedded in the cornea for a long time, and is the source of constant inflammation and pain, till suppuration takes place around it, and allows it to drop out.

It sometimes happens that, after a body is imbedded in the cornea, a layer of a new

substance is formed over it, so that it does not excite any inflammation, but remains through life in a kind of sac. I have observed this process begin and be completed in a case where a small portion of the iris had been pushed through an ulcer of the cornea. The cornea near the prolapsed iris became obscure, and the opaque matter was daily effused from the circumference towards the centre of the opening, so as finally to cover the prolapsed iris so completely, that it appeared afterwards like a common *speck* of the cornea.

It is by no means an uncommon thing to hear of extraneous substances, as musket-balls, &c. remaining during life in different parts of the body, by forming to themselves, in a similar manner, a kind of sac. In one case, I found a piece of whin-stone inclosed in a sac of cellular membrane, lying close to the sclerotic coat, which had remained for ten years prior to the person's death, without his experiencing the least uneasiness from it, or even suspecting its presence.

Manniske of Frankenhausen mentions a curious case in Loder's Journal *, where a body, which stuck in the conjunctiva covering the white of the eye, gradually advanced to the central part of the cornea. I shall quote the case in his own words:

"A priest requested my assistance concerning a speck on the eye, in the year 1792. He had on the cornea of the right eye a dark speck, which impaired much his vision, of which he gave me the following account: Two years before, he found suddenly a little pain in the eye. By examination he remarked, on the white of the eye, below the upper-lid, a black spot; it did not hurt his sight, and the pain soon went away, so he took no further notice of the accident. Some time having elapsed, he was aware that this spot had changed its situation, and had appeared at the union of the cornea with the sclerotic coat. Now the case appeared to

* *Vide* Journal für die Chirurgie, &c. Von Just. C. Loder, 2d. Band. 1st. Stuck. 1799.

him doubtful. He asked the opinions of many medical men, and made use of many external and internal medicines, without any effect. The speck continued its progress very slowly, but uninterruptedly; it came forwards on the cornea, approached towards the pupil, and at last covered a portion of it. The patient was in this situation when I saw him. There was a prominent spot above the cornea, which felt hard, and was the size of a small lens, but longer than it was broad. Many small red vessels appeared like streaks around it. The patient had no pain. The undescribable hardness of the spot, along with its situation, made me think that it was a foreign body fastened in the eye. I made an incision on the spot from without inward, and saw, with the assistance of a microscope, a black body lying in the incision. I removed it with the point of the knife, from the small hole it had formed for itself in the cornea, and found it to be a hard wing-case of a beetle."

CHAP. X.

OF OSSIFICATION OF THE CORNEA.

THE deposition of *bony* matter is a morbid change, which has been met with in almost every organ of the body. I have seen only one instance of it in the cornea; and in that case, the whole eye was changed in its form, and the cornea had become opaque. On macerating the cornea, a piece of bone, weighing two grains, oval shaped, hard, and with a smooth surface, was found between its lamellæ. A piece of bone was also found between the choroid coat and retina of the same eye. When dissecting a cornea for an ana-

tomical purpose, of which no history could be obtained, I found several gritty particles and inequalities on its internal surface.

Walter had in his museum a piece of cornea, taken from a man sixty years of age, in which a bony mass was enveloped, of a long shape, three lines in length, two lines broad, and weighing two grains *.

A very curious case, of a piece of bony matter, which was formed in the substance of the cornea, or immediately behind it, was communicated to me by Mr Anderson, Surgeon at Inverary. "The patient was a woman of about 31 years of age. Upon carefully examining her right eye, I observed a substance of a whitish appearance, in the under part of the globe of the eye, arising from the inside of the sclerotic coat, and extending upwards, below the cornea, over a great part of the iris, to very near the pupil. It had seemingly communicated much irritation to the eye, and induced a degree

* Anatom. Museum, B. I. S. 139. No. 275.

of inflammation, severe pain, almost a constant flow of tears, inability to bear the light, with a considerable diminution of sight. The ball of the eye performed its natural rotatory motion, but was less in size than the left eye. This complaint had been occasioned fifteen years ago, by a fall at the root of a tree, by which one of the roots struck against her right eye, but did not cut any part of it.

From this period, the said substance had begun to grow, and gradually increased in size; but the pain in the eye, and other symptoms, were sufferable until about nine months ago, when the complaint became more violent. I advised her to submit to an operation, for the purpose of extracting the said substance that appeared to injure her eye, to which she readily agreed. I made an incision into the cornea, in the manner recommended for the extraction of the cataract, then raised the flap of the cornea with a flat crooked probe, and, with the same instrument, turned out a small piece of bone. The upper part of the bone

was as thin as a piece of paper; at the under part it was thicker, porous and brittle, of an irregular semilunar form, and about the size of half an ordinary silver sixpence. The upper part was quite detached, but the under part slightly adhered to some part of the globe out of sight; but it was easily extracted without requiring the use of the knife to separate its adhesions. From the unsteadiness of the patient, she would not permit me to examine from what part the ossification originated. I am consequently at a loss, whether to suppose it took its growth from any of the coats of the eye, or if any osseous matter might, in consequence of the accident, collect within the said coats, and, in the course of fifteen years, form a complete bone."

The cornea varies very much in its firmness of texture, at different periods of life, and in different individuals, at the same age. In the fœtus, its cellular lamellæ adhere to one another loosely, so that it is thick and spongy, whilst in old people it is sometimes

extremely hard and coriaceous: And Angely * remarks, that he has sometimes met with it in old people as hard as a piece of wet cartilage.

* Commentatio Medica de Oculo, originisque lacrymalibus. Auctore, J. L. Angely.—Erlangæ, 1803.

CHAP XI.

OF THE SPECK OF THE CORNEA *.

1. *Of the Varieties of the Speck of the Cornea.*

ALTHOUGH the cornea is naturally quite transparent, yet it often happens, that the means which are employed to preserve it in that state, are not sufficient to prevent it from being rendered obscure by disease. The obscurities or specks to which it is liable, are observed to be of very different shades, varying from the slightest perceptible cloudiness or mist, to a dense white, or

* Macula Corneæ,—Die Verdunklung der Hornhaut, or Die Flecke of the Germans.

pearl-coloured opacity. These great varieties in the degree of the obscurity, as well as those which occur in the shape, the mode of formation, the relative position and extent of corneal specks, have induced some authors to consider them as distinct species, and to distinguish them by particular names. As the meaning, however, of these names is very ambiguous, there being scarcely two authors who use the same word to denote the same variety of the disease; and also, as it will appear that there is such a close resemblance between some, and such a similarity of character in all the forms in which specks appear, these arrangements are not only useless, but inconsistent. Instead, therefore, of introducing a variety of names, or attempting to arrange in a systematic manner, the varieties of this morbid alteration of structure, we shall consider it in whatever form it may appear, or in whatever degree, under the general name of obscurity of the cornea, or corneal speck.

The first, and most simple variety or form of corneal speck is, when a particular part of the cornea loses its natural transparency, and appears clouded, objects appearing to the patient as if seen through a mist or smoke. Such obscurities are either undefined, or distinctly circumscribed, and have either an equal degree of opacity throughout, or one part is more opaque than the rest. They are most commonly of a circular or rounded form, but, in some cases, their shape is very irregular. Their size varies from the smallest spot to such an extent as to occupy the whole cornea *.

In a second form of the corneal speck the opacity is of a darker shade; it gives the cornea a bluish, or, in some parts, a white milky appearance. It is seldom equally opaque through its whole extent, being generally more so at the centre, and becoming gradually of a lighter shade towards the mar-

* See Plate V. fig 1.

gin. In some instances, the shade is very unequal in the different parts of the speck *.

In a third form of the corneal speck, the cornea becomes of the opaque glistening white colour of common pearl; and the opacity generally extends through the whole of the lamellæ of the cornea, so that if even several of those layers which are external be removed, the remaining ones continue to form a complete obstruction to the entrance of light. Specks of this description sometimes produce a slight thickening of the cornea, and are accompanied with adhesions between the cornea and iris. They are almost always distinctly circumscribed, and, if of any considerable size, they are nourished by one or more red vessels †.

In the first form of speck, the iris can be seen through the diseased portion of the cornea; but, in the second and third forms of the disease, the degree of opacity is such,

* See Plate V fig. 2.

† See Plate V. fig. 3, and Plate VI. fig. 1 and 3.

that nothing can be accurately distinguished behind it. If there is an active inflammation accompanying the speck, the red vessels will be seen in a cluster on that part of the sclerotic coat nearest to it; and some of the branches may often be traced passing over the edge of the cornea, and terminating in the substance of the speck. As the accompanying inflammation abates, the number of the red vessels on the cornea commonly diminishes; but sometimes one or more trunks remain, and are distributed on the speck. In some cases there are large specks, with numerous blood-vessels supplying them during the continuance of active inflammation, and although the opacity remains extensive after the inflammation abates, yet no red vessels continue to nourish it. The number of blood-vessels is in no case in proportion to the extent or degree of the opacity during any stage of the accompanying inflammation; for we frequently observe a net-work of blood-vessels on a cornea which has very little obscu-

rity, and at other times there is a large opaque spot with only one, or even without a single red vessel supplying it.

Specks appear on every part of the cornea, but, as far as I have been able to observe, they occur most frequently towards its centre.

They vary in number: Commonly there is only one; but it frequently happens that there are two, three, or more distinct spots on one cornea, all of which differ in their size, shape, and in the degree of opacity.

Specks impede the function of vision in proportion to the degree of their obscurity, and according to their situation. Even a speck of the lightest shade, which is hardly perceptible to a common observer, if it is placed directly opposite the pupil, materially injures the sight; whereas those of the most opaque kind, if placed beyond its circumference, diminish the sphere, but not the accuracy of vision. In those cases where the speck is of a moderate size, and placed towards the centre of the cornea, the patient sees better in a

dull than in a clear light; for in a clear light the pupil contracts so much that it is covered by the speck, and the rays of light are prevented from entering it; but in a dull light it dilates and becomes larger than the speck, so that the rays of light enter by its edge. Specks impede vision more when they are situated on the under than on the upper half of the cornea.

Those who have a speck on the cornea are apt to have a squint. In one case, this was so remarkable, that I found it impossible for the eye-ball to be turned, so as to render more than one half of the cornea visible.

In some cases, where the speck is situated towards one side of the cornea, the pupil seems to have a tendency to dilate towards that portion which remains transparent. I observed this in an adult who had completely lost the sight of one eye, and had a large speck formed on the temporal and central part of the cornea of the other eye soon after birth. The pupil was very considerably dilated towards the nasal part,

which remained transparent; so that, by this effort of nature in drawing the pupillar opening from the opaque to the transparent part of the cornea, the patient was enabled to guide himself through the streets, and in twilight he could see large objects around him with considerable accuracy. I observed the same thing also take place in a young woman's eye, under precisely similar circumstances.

Specks seldom produce any very sensible alteration in the external form of the cornea. In some cases where the inflammation has been very violent, or where the disease has been of long duration, the cornea becomes thickened, so that its internal surface comes in contact with the iris, and adheres to it, suffering at the same time a slight increase in its convexity; and in many cases a cornea, which for some time was only opaque, becomes at last staphylomatous *.

Besides those varieties of specks of the cornea which have been described, there are

* Vide Staphyloma, and Plate VI. fig. 3.

others that occur much less frequently, the mode of formation and appearances of which are somewhat different.

I have remarked a few instances where the cornea acquired a very peculiar mottled appearance. In one case this was the consequence of an inflammation of the eye, which came on during a mercurial course, and, in another, it was the effect of an inflammation brought on by lightning. In both these cases, some parts of the cornea retained their transparency, while the rest of it was covered by a number of small white rounded spots, varying in their degree of obscurity.

In some cases the opacity, instead of being formed towards the central part of the cornea, or at some distance from its circumference, begins at the place of the junction of the cornea and sclerotic coat, and gradually extends towards the centre of the cornea, forming an opaque ring around its circumference. Most authors have described this as an appearance only to be remarked in the eyes of old people,

and have given it the name of *arcus senilis*. But I have observed it at all periods of life, and it may be seen in several of the drawings which were taken from young subjects *. It generally appears like a bluish ring at the edge of the cornea, running round the whole circumference. It is almost universally to be found in the eyes of old people, and it increases in breadth as the person advances in life; but it is never attended with any impediment or inconvenience to vision.

In a few instances I have observed a cloudiness gradually extending from several points, or from the whole circumference of the cornea towards its centre, which, in most cases, went off along with the inflammatory symptoms by which it was accompanied; but in others it was more permanent.

* See Plate I. fig. 1, Plate III. fig. 3, Plate V. fig. 3.

2.—*Of the Formation of Specks of the Cornea.*

Specks most commonly are either preceded or accompanied by inflammation of the cornea. In children they occur very frequently during the progress of the more severe cases of the purulent ophthalmia, also in small-pox and measles, in that peculiar inflammation of the eyes which is accompanied with eruptions of the head, and in almost all those inflammations in which the cornea participates. Lues venerea and scrofula, each of which produce specific inflammations of the different parts of the eye-ball, also occasion various degrees of obscurity of the cornea. Likewise wounds, accidentally inflicted on the cornea, or in the operation of extraction of the cataract, if they do not unite without suppuration, generally leave a very opaque mark; and ulcers, if they have been deep, or of long duration, are followed by a white pearl-coloured speck.

When the inflammation accompanying a speck abates, the speck most commonly diminishes, and the opacity which remains becomes more distinctly defined, and less opaque, or, if it is small, it entirely disappears.

In some instances the cornea acquires a very remarkable degree of obscurity, when the inflammatory symptoms are apparently mild, and where there is very little perceptible redness. I have observed several instances of this kind, and in all of them the obscurity came on by very slow degrees, and was attended by no pain. In the 2d vol. of the London Medical Communications, there is a description and history of two children by Mr Farr of Deptford, where the corneæ acquired a very remarkable degree of obscurity, without much apparent inflammation. A very accurate account of several cases of this kind is also given by Mr Ware of London, in his excellent Treatise on Ophthalmia.

The length of time necessary for the formation of specks varies much in different instances. In some cases they are formed very slowly, and do not acquire any great degree of opacity, even when the inflammatory symptoms are extremely violent. Most frequently they require several weeks or even months before they become either large or very opaque; so that when they are of very considerable size, they have generally been formed after repeated inflammatory attacks, each attack adding to their size and degree of opacity. Sometimes they are formed very rapidly, as in cases where the cornea is wounded, or where a foreign body has adhered to it.

Specks are formed at every period of life, but they occur much more frequently in young people; probably because in them the cornea is much softer and more spongy, and, also, as they are more subject to various inflammatory complaints of the eye. The specks which are formed rapidly are generally most speedily removed, whilst those whose

progress is slower disappear in a very gradual manner. They are removed much more quickly in children than in old people, and in them also a much greater degree of obscurity can be made altogether to disappear. When applications are employed with the view of removing specks, the obscurity generally diminishes much more rapidly for a short time at first than at any future period. Dr Vetch, in his ingenious treatise on the Egyptian Ophthalmia *, gives an account of a singular instance, which shews the rapidity with which some kinds of specks disappear under particular circumstances. It occurred in a man during his convalescence from ophthalmia. " Some pectoral symptoms, to which he had been long subject, suddenly assumed the appearance of pulmonary consumption, which proceeded in a rapid manner towards its last stage : five days previous to his death, he was seized with a violent

* See an Account of an Ophthalmia, &c. by John Vetch, M. D. 1807.

aggravation of the hectic fever and the other symptoms; and his death was hourly expected. At this time, to the surprise of all his attendants, the opacities, by which the vision in both eyes had been long obstructed, disappeared with an amazing rapidity; and, a short time before his death, his vision became nearly as distinct as ever." —A case, though of a different kind from that now quoted, deserves to be mentioned in this place, as it strikingly illustrates the same remarkable power in the absorbent system. The patient had a very perceptible obscurity of the crystalline lenses of both eyes, which had considerably impaired his sight. This complaint had continued for several months, when he was seized with a pain of the breast, attended with fever and spitting of blood. These symptoms continued for several weeks, and, during that period, the obscurity of the crystalline lenses altogether disappeared, and his vision was restored. I saw him many months afterwards, when his eyes continued well.

3.—*Appearances of Speck on Dissection.*

When the cornea is examined after death, no change of structure can be observed in those cases where there had been a mere cloudiness, or general opacity during life; for even before death, more especially if it is slow and lingering, the fluid which, in the natural state, is deposited between the lamellæ of the cornea, exudes, forming an obscure layer over its anterior surface, and the aqueous humour oozes out, giving the cornea an unequal puckered appearance *. Indeed, it is from this change in the eye that approaching death is often foreseen; for whenever the cornea begins to collapse, and becomes turbid, the eye loses all its lustre and intelligence, and gives that awful expression to the whole countenance, which has been called *facies hypocratica*.

* *Vide* Anatomie Descriptive, par Xav. Bichât.

When the cornea has been much more opaque, no other change is to be perceived after death, than a diminution of the transparency, either of the external lamellæ, or of the whole substance of the cornea. I have had many opportunities, in the living body, of taking off layers of very opaque specks, and I have never been able to observe any other change, except that, in some of those which have been of long duration, the cornea had acquired a degree of hardness much greater than that of a sound cornea.

In most cases, too, a speck bleeds when a piece of it is removed in the living body; and I have observed this happen, even when no red vessels passing into it could be detected by the naked eye. An incision made in the healthy cornea, gives little or no uneasiness, but, when the portion of a speck is removed, it often excites acute pain.

4.—*Causes of Specks of the Cornea.*

As the deposition or effusion of the albuminous part of the blood is a common effect of inflammation in many organs of the body; and as this change produces a diminution of the transparency of the serous membranes, it is probable, from the analogy in the natural structure, that it is a similar change which takes place in the cornea, during the formation of specks. This effect of inflammation is very remarkable in the pleura, after an attack of pleurisy; in the peritoneum after peritonitis; and in the membranes of the brain after phrenitis; for on dissection it is invariably found, that there is not only an effusion of albumen on the surface of the inflamed membrane, but the membrane has become thicker, changed its colour, and lost its transparency.

It is perhaps difficult to determine, whether this new matter, added to the diseased membrane, be effused among its layers, but it

appears to me the most probable opinion. It has been already remarked *, that the cornea is composed of a number of concentric cellular lamellæ, and that there is a fluid deposited in the cells by exhalation. It is, therefore, in the cellular structure in which this fluid is contained, that the albumen may be deposited, the cells being like as many serous surfaces, and therefore subject to similar morbid changes.

An opacity may also be produced by the cornea losing its vitality. This change may arise either from the inflammation of the cornea being so violent as to terminate in the death of the part, or from the action of caustic substances, such as lime, lunar caustic, &c †.

It is also probable, that the cornea may become obscure, in consequence of an alteration in the quantity of the contents of the eye-ball, producing a change in the arrangement of its component particles. In the

* See General Remarks on the Cornea.

† See Ulcer of the Cornea.

dead body this change is very remarkable, for if pressure be applied to the eye-ball, or if the ophthalmic veins be injected with quicksilver, or pure water, so that the quantity of the contents of the eye-ball is increased, the cornea is found to lose its natural transparency, and to acquire a milky colour *. As it was probable, from this curious phenomenon in the dead eye, that, in the living body, some opacities of the cornea might arise from an increase in the quantity of the contents of the eye-ball, it occurred to me, that, in cases of this kind, the opacity might be removed, by making an incision through the cornea, and discharging the aqueous humour. That a certain degree of opacity of the cornea in the human eye, is sometimes produced by a mere derangement of its component particles, is proved from the immediate effects which followed the discharge of the aqueous humour, in cases where the opacity had a ge-

* See The Muscular Motions of the Human Body, by John Barclay, M. D. 1808.

neral clouded appearance over the whole cornea, besides some defined spots at particular places. In some cases of this kind, the instant I discharged the aqueous humour, by a small opening made in the cornea, I observed that all the general obscurity disappeared, and nothing remained but the more opaque spots, which became more distinctly circumscribed *.

In the lower animals, I have had several opportunities of observing the cornea affected with a general obscurity and cloudiness, which was not like common speck, but more resembled that obscurity so easily produced artificially in the dead eye, by injecting the veins, or by the application of pressure. A disease of the cornea very similar, is common among sheep which have made long journies, or have been much fatigued; and although the opacity of the cornea in them is

* See Observations on the Effects of Evacuating the Aqueous Humour in Inflammation of the Eyes, in the Edinburgh Medical and Surgical Journal for January 1807.

accompanied with little apparent inflammation, or fulness of vessels, its transparency is quickly restored by the common practice of the shepherds, which is opening a vein at the inferior part of the orbit, and allowing the blood to flow over the eye *. The same kind of obscurity of the cornea is by no means unfrequent among dogs and horses.

* See Dr Duncan's Essay on the Diseases of Sheep, in the Transactions of the Highland Society of Scotland.

CHAP. XII.

OF THE STAPHYLOMA.

When the cornea, besides losing its transparency, swells to such a degree that its internal surface comes in contact with and adheres to the iris, and when it forms a prominent tumour externally, the disease has generally been called Staphyloma *.

This term, however, has had very extensive applications, having been employed by some authors to denote not only various morbid changes of the cornea, but also a va-

* Das Staphylom,—Der Forfall der Hornhaut of Richter.

riety of tumours involving other parts of the organ of vision. I shall, follow Richter, and limit its signification to those changes which produce an alteration in the structure and form of the cornea. When the structure of the whole cornea is changed, it has been called the *staphyloma totale*, and when the disease is confined to a particular part, *staphyloma partiale*.

In the staphyloma, where the whole cornea participates in the disease, it generally assumes a more or less conical form, loses entirely its natural transparency, and vision is completely destroyed. The opacity is often most remarkable towards the apex of the tumour, and is generally of a pearl-white colour, diffused through the whole corneal substance *. In some instances I have observed the opacity confined to one-half of the cornea, and this was generally the inferior one †.

* See Plate VI. fig. 2

† Plate VI. fig. 3.

The internal surface of the cornea adheres to the iris in almost every case of staphyloma; for as the internal lamellæ, as well as those which are external, increase in thickness, they come in contact with the iris, and the accompanying inflammation produces a permanent adhesion between them; so that, in this disease, the anterior chamber is often found almost entirely obliterated. This happens most frequently in children, as in them the cornea is much thicker than in adults, and is very nearly in contact with the iris even in the sound eye.

In staphyloma, the pupil is hid according to the situation and degree of the opacity of the cornea; but in most cases it is altogether obliterated, and even in those where a transparent portion of the cornea is opposite to it, the vision is much impaired; for as the eye has lost its form as an optical instrument, the change in its refractive power must render objects seen through it very indistinct.

If the tumour is recent, and has not acquired a very large size, the diseased por-

tion of the cornea, when cut into, will be found to be softer and more spongy than the transparent part; and generally, if the incision penetrates into the anterior chamber, only a very small quantity of aqueous humour flows out. This is more particularly the case in children. For when the tumour is large, and when it forms in an adult, the cornea often becomes extremely hard, and much thinner than natural, and the quantity of aqueous humour, instead of being diminished, is greater than in the sound eye. Scarpa mentions his having found the cornea, in some cases of staphyloma, as hard as parchment, or even converted into bone: Richter* mentions a case where it resembled a cartilaginous excrescence, and Beer † describes and gives a delineation of one which was so thick and tough, that, in cutting it away, he could scarcely penetrate it with the

* Chirurgische Bibliothek, Vol. 8. S. 76.

† Practische Beobachtungen über den grauen Staar und die krankheiten der Hornhaut. Wien 1791.

knife. There is generally one or more red vessels ramified over the sound part of the cornea *(vasa nutrientia)*, which are continuations of vessels on the sclerotic coat *.

After an wound has been made through the cornea, penetrating into the anterior chamber, and a small portion of cornea removed, so as to prevent it from healing up immediately, a violent inflammation generally ensues. A suppuration afterwards takes place, and the sore gradually heals. Sometimes, even after this operation, the tumour continues to increase in bulk, but, in other cases, it produces a permanent diminution and collapse of the whole organ. In a case where a small portion of the apex of a large staphyloma was removed, and scarcely any humour could be observed to escape during the operation, and when, consequently, it produced no immediate change upon its bulk, the contents of the eye soon after began to be absorbed,

* See Plate VI. fig. 2, and Plate VII. fig. 3.

and in a few months were so much diminished, that the eye-ball could be completely covered by the eye-lids.

When vision is altogether destroyed, and the disease has extended far, the humours collect in great quantities, and, in some cases, form a tumour of an enormous size *. In such cases the eye does not retain its conical form; for when the cornea has become so much distended, and when the humours have insinuated themselves between its lamellæ, one part yields more readily than another; the tumour becomes more irregular in its form, hangs over the under eye-lid, and, in many cases, has the appearance of a large swelling composed of several smaller ones. A change also takes place in the colour of the tumour. Instead of the opaque white, or pearly coloured opacity, it becomes of a dark blue colour, and sometimes one or more of the smaller swellings are semi-transparent. A fluid can be felt fluctuating within them,

* Haller's Dissertationes Chirurg. Tom. 1. p. 25.

and they appear as if ready to burst. The blood-vessels increase both in number and size along with the bulk of the tumour, and they will sometimes be seen ramifying and forming net-works in a most beautiful manner over its whole surface *. If the bulk of the swelling prevents the eye-lids from closing, the exposure to bodies floating in the air, and the contact of the ciliæ excite always more or less inflammation over the eye-ball and lids; and at the same time it often happens, that the tears are of an acrid and irritating quality, inflaming and excoriating the outer surface of the palpebræ and cheek. In this situation the patient is often relieved by a part of the tumour giving way, and allowing the contents of the eye-ball to escape. Even when this has taken place, and after the inflammation which it has occasioned has abated, the disease sometimes returns as before, and a large staphylomatous tumour is again formed. More fre-

* See Plate VII. fig. 3.

quently, however, the organ remains collapsed into a whitish mass, in which no vestige remains of the natural structure.

The sudden relief which is produced by the discharge of the contents of an eye affected with staphyloma, may be accounted for on the same principles as the practice of evacuating the aqueous humour in violent inflammation of the eyes, or the rupture of a common abscess. This effect is so strikingly illustrated, and so accurately described in the following case of a medical gentleman who had been seized with violent ophthalmia which brought on staphyloma, and deprived him of his sight, that I shall give the account of his case in his own words. "When my eyes were examined, I was told that there was a considerable elevation of the cornea of both of them, but particularly of the left; indeed this was quite evident to my own sense of touch. In July 1800 I returned to England; and, on my voyage from London to Edinburgh, I was much surprised one morning when I awaked,

to find that the aqueous humour was completely discharged from the left eye; the eye being quite soft. The opening by which it had escaped soon closed, and the humour again collected; but I conceived that the cornea was not quite so prominent as formerly. From this circumstance I concluded, that if the humour were again evacuated, the eye might assume its natural form, or at least approach nearer to it. In March 1801, I attempted to make a small perforation in the cornea with a large needle, and succeeded easily in evacuating the aqueous humour. This, I think, was repeated at least three times, and the eye gradually acquired its present shape. I wished to perform the same upon the right eye, but was baffled, on account of its greater sensibility. If I can place any dependence on my own feelings, I think the left eye was never perfectly free of inflammation until the above mentioned evacuations were effected; though they were made without having the most distant idea that such would be the result of them.

About three years ago, when rubbing the right eye with my finger, it suddenly became soft, part of the aqueous humour having been discharged. Since that time, two or three drops have flowed out in the space of every week. But if, as it sometimes happens, the discharge does not take place in the space mentioned, I am in general seized with a pain immediately above the right eye-brow, accompanied with the sensation of tension, and uneasiness of the eye itself: These symptoms, however, vanish when the accidental evacuation takes place.

When the humour was first discharged, a small degree of pressure upon the eye, when soft, gave considerable uneasiness; and the pain seemed to be situated in the bottom of the eye. The pain, however, is not now excited by the same degree of pressure."

After a staphyloma has burst, and a new tumour is formed, it commonly resembles the original one in every respect; and in some cases, this alternate discharge and regeneration has taken place two or three times before

the eye finally collapsed. Mr Thomson informs me that he has remarked several cases, where a fistulous opening remained long after the tumour burst, through which a humour, resembling the aqueous, continued to be discharged.

Staphyloma most frequently occurs in children after the small-pox, measles, purulent ophthalmia, or violent inflammation of the eyes from other causes. The cornea being in them more spongy in its texture, and much thicker than in adults, is probably the cause why, as in specks, they are more subject to this disease *. Scarpa mentions, that he never saw a staphyloma of such a size as to project beyond the eye-lids, which did not begin during childhood. I have, however, seen several instances, particularly where the disease arose in consequence of an wound, in which the tumour extended beyond the eye-lids, and did not commence till the pa-

* Angely, Commentatio Medica de Oculo, &c. Erlangæ, 1803.

tients were advanced in life. These cases are no doubt rare. Staphylomas which arise after wounds in the eye with sharp pointed instruments, present nearly the same appearances as those which have been already described. In such cases, the swelling is generally more irregular in its shape, the coats of it are thinner, the disease advances more rapidly, and is attended with much more pain and inflammation.

Staphyloma generally attacks only one eye; in some cases it affects both, and it is not unfrequent to see a person with two staphylomas, in consequence of small-pox, &c. I have seen one case, where the sympathy between the two eyes was very remarkable. The person received a blow with a pike on one eye, which produced staphyloma, and more than a year afterwards, the other eye became inflamed, and the cornea of it also gradually became staphylomatous.

Staphylomas are variable in their progress; sometimes they grow suddenly to a certain size, and afterwards remain stationary; some-

times they grow progressively larger till they burst; and often they increase in bulk as if by starts. From small-pox particularly, and also in consequence of the purulent ophthalmia, staphylomas grow rapidly, and the coats of the tumour appear extremely thin; but, after some time, they seem to acquire additional thickness and strength, the tumour remaining of the same size.—Richter * remarks, that the swelling and thickening of the cornea sometimes go away with the accompanying inflammation.

Staphylomas sometimes also occur, where a small portion of the cornea is affected, in which case they are called *Staphyloma partiale.* Sometimes there is only one swelling of this kind, and sometimes several of them arise in the same cornea, and form an irregular shaped mass, which has been compared to a cluster of grapes; hence the name *staphyloma.* Such swellings vary from the size of a pin head to that of a small

* Richter's Anfangsgründe.

pea. In some cases they are transparent, communicate with the anterior chamber, and contain a quantity of the aqueous humour, or even a portion of the iris. More commonly they are horny or warty excrescences, and if cut off, they generally grow again *.

Tumours of this kind are often observed where there have been wounds or ulcers of the cornea; but they are also met with where there has been no such previous cause.

There is also a formidable disease, a few examples of which I have seen, and traced the progress, which, perhaps, may be with more propriety considered as a variety of staphyloma than any other disease. It occurred in adults, whose eyes had been exposed to much fatigue, and suffered from deep-seated, long continued inflammation; and I have seen one or two cases of this disease, where, from its commencement, and during its whole progress, there was neither pain nor any inflammatory symptom. Whilst the sphericity of

* Richter's Anfangsgründe.

the cornea increased, the aqueous humour became turbid, and substances were seen floating in it, resembling flakes of the black pigment. The crystalline lens also became opaque, and appeared to separate into pieces, and moulder down. The sclerotic coat became preternaturally distended, and instead of retaining its pearly white colour, it assumed a dark blue, or almost black shade. At last, a large prominent tumour was formed, more spherical than the common staphyloma, which terminated by bursting, and in a total loss of the organ.

CHAP. XIII.

OF ALTERATIONS IN THE FORM OF THE CORNEA.

THE form of the cornea varies in different people, and in the same individual at the different periods of life. In many it is so convex, that objects are seen very indistinctly, unless when held close to the eye, or viewed with the assistance of concave glasses. This preternatural convexity of the cornea is sometimes the failure of original organization, at other times it is produced from some morbid change. The cornea is always more convex at the earlier periods of life, and, as far as I have been able to ob-

serve, it is very liable to acquire its greatest degree of convexity about the age of puberty, people being most apt to become *short-sighted* at that period.

When people advance in life, the cornea gradually loses its convexity, in consequence, perhaps, of the quantity of humours within the eye-ball being diminished. In one case, of a girl eight years of age, the corneæ of both eyes were observed to be remarkably flat, and her vision very imperfect from her infancy. In people much enfeebled by considerable evacuations, by numerous bleedings, or by disease, the quantity of the aqueous humour diminishes, the convexity of the cornea is lessened, and their sight is enfeebled, so that they are not able to see objects but at a distance *.

The cornea is also observed to collapse at the approach of death, particularly if it is slow and lingering †.

* Vide Anatomie Medicale, par Portal.

† Vide Anatomie Descriptive, par Xav. Bichât.

From the ingenious experiments of Mr Everard Home, and the late Mr Ramsden, recorded in the Philosophical Transactions, it appears that the sphericity of the cornea is altered according to the distance at which objects are viewed.

The power which the eye has of changing its form, is also very remarkable in those people who have had the operation of the extraction of the cataract performed; for, when the eye has recovered from the inflammation and irritability occasioned by that operation, so as to allow the person to look at objects, it requires, most commonly, the assistance of a lens of two and a half inches focus to read a common printed book; but, if after a few weeks, a lens of a lesser power be used, the eye, by gradually accommodating itself to the change, will see very distinctly with a glass of a much smaller power than what was first necessary. Thus a person who has had this operation performed, generally finds his sight improve for many months after it; and the change ap-

pears to arise chiefly from the cornea gradually acquiring a greater degree of convexity, from the action of the muscles of the eye-ball.

Besides these slighter changes in the form of the cornea, it sometimes increases to such a size, or collapses so much, whilst, at the same time, it retains its transparency, that the functions of the eye are much interrupted, or even entirely destroyed. In the first case, the disease has been called by some authors the *staphyloma pellucidum ;* in the second *Rhytidosis.*

Levéillé †, the French translator of Scarpa's work on the diseases of the eye, has described a case where the cornea of both eyes became of a conical form. Two examples of a similar disease have fallen within my own observation ; but only one eye was affected in each of them. In both cases, the conical figure of the cornea was very remarkable, and the apex of the cone was in the centre of the cornea. When the eye was viewed

† Vide Traité sur les Maladies des Yeux, traduit de l'Italien de Scarpa, par J. B. F. Levéillé, Tom. II. p. 179.

laterally, the apex resembled a piece of solid crystal, and when looked at directly opposite, it had a transparent sparkling appearance, which prevented the pupil and iris from being distincly seen.

One of these cases occurred in a lady upwards of thirty years of age, and the changes produced in her vision were very remarkable. At one, or one and a half inch distance, she could distinguish small objects distinctly, when held towards the temporal angle of the eye, although it required considerable exertion; but the sphere of vision was very limited.

On looking through a small hole in a card, she could distinguish objects held very close to the eye, and could even read a book.

At any distance greater than two inches vision was very indistinct, and at a few feet she could neither judge of the distance nor the form of an object.

When she looked at a luminous body at a distance from her eye, such as a candle, it was multiplied five or six times, and all the

images were more or less indistinct. She could never find any glass sufficiently concave to assist her vision. She did not remark this complaint in her eye, until she was about sixteen years of age, and she does not think that it has undergone any change since that time.

On mentioning to my ingenious friend Dr Brewster this case, which appeared to me so remarkable, he had the politeness to examine the eye, and to favour me with the following letter, giving a most satisfactory and philosophical explanation of all the phenomena :

"When you first mentioned to me the case of Miss ———, I was much surprised at the number of images which she observed round luminous objects. As this multiplication of images could arise only from some irregularity in the cornea, or crystalline lens, which gave their surface the form of a polyhedron, it was completely inexplicable from the shape of the cornea itself, which your drawing represented (see Plate VII.

fig. 1.) as a regular surface, resembling very much that of a hyperboloid; for the only indistinctness occasioned by a cornea of this form, would arise from the concentration of the rays before they fell upon the retina.

When I had the pleasure of examining the eye itself, the difficulty of explanation was in no respect diminished. In every aspect in which the cornea could be viewed, its section appeared to be a regular curve, increasing in curvature towards the vertex; a form which could produce no derangement in the refraction of the incident rays. As the disease was evidently seated in the cornea, which projected to an unnatural distance, it did not seem probable that there was any defect in the structure of the crystalline lens. I was therefore led to believe, that the broken and indistinct images which appeared to encircle luminous objects, arose from some eminences in the cornea, which could not be detected by a lateral view of the eye, but which might be rendered visible by the changes which they induced upon the image

of a luminous object that was made to traverse the surface of the cornea. I therefore held a candle at the distance of fifteen inches from the cornea, and keeping my eye in the direction of the reflected rays, I observed the variations in the size and form of the image of the candle. The reflected image regularly decreased when it passed over the most convex parts of the cornea; but when it came to the part nearest the nose, it alternately expanded and contracted, and suffered such derangements, as to indicate the presence of a number of spherical eminences and depressions, which sufficiently accounted for the broken and multiplied images of luminous objects."

Mr Phipps of London, who was consulted in this case, remarked to me, that he has had the opportunity of watching the progress of several cases where the cornea had become conical, and that he never found it in persons younger than fourteen or sixteen. "It is a change," he observed, "which sometimes takes place at the age of puberty;

and, when the cone is once complete, the disease seldom makes any further progress, or suffers any other change, than that the apex sometimes becomes opaque."

Beer * mentions, "That there is a kind of staphyloma worthy of remark, which I have seen in more than one case of hydrophthalmia." He adds, "The cornea, in such cases, is inconceivably distended, but it does not lose its transparency; when it is punctured, it is found to be very thin; it has happened also that sometimes it has burst. The patients, notwithstanding the transparency of the cornea, saw little or none at all.

"I had the last year an opportunity to observe a remarkable case of this kind in a woman, who, after an inflammation of the brain, was seized with a violent inflammation of the left eye, which was properly treated, and got well. Soon after, she was attacked with a very violent pain in the left half of the head, and afterwards with an uncommon weakness of sight. The eye was a

* Pratische Beobachtungen über den Grauen Staar, &c.

little red afterwards, and then swelled; the pupil was very much dilated, and contracted but slowly. During this attack, the iris gradually changed its colour, and became at last quite red. The stinging pain soon became heavy and beating, and the patient lost the sight of this eye altogether, whilst the cornea continued to expand. I was at last forced to make an incision into the cornea, to prevent its bursting, but the aqueous humour was soon renewed.

"I was forced to repeat the operation; and the constant application of a cold vinous infusion of bark after it, prevented the eye from again filling. The organ afterwards remained shrunk; the iris retained its reddish colour; the pupil remained much dilated and immoveable, and she never recovered her sight*."

Richter† says he never saw this disease; Burgman‡ saw a very remarkable case, where

* See Plate VII. fig. 2.

† Richter's Anfangsgründe.

‡ Haller Disputationes Chirung, Tom. II.

the corneæ of both eyes of a person who was hanged, were so prodigiously extended, that they reached down to the mouth like two horns.

The corrugation or collapse of the cornea, arises either from a diminution in the quantity of the contents of the eye-ball, or from some disease of the cornea, or sclerotic coat. Violent inflammation of the eye, wounds and ulcers of the cornea, penetrating into the anterior chamber, are frequently followed by this disease.

After violent deep-seated ophthalmia, it is not unfrequent to observe the eye-ball altered in its form, and become smaller; and the change appears to arise chiefly from a diminution of the anterior chamber. Sometimes the change is only such that the cornea becomes nearly a plane surface, and comes into contact with the iris. In other cases it becomes puckered, and forms a furrow, sometimes at one part, at other times completely across the cornea.

The adjoining part of the sclerotic coat takes sometimes the same form, and is corrugated in a similar manner. It seldom occurs that there is such a total change in the appearance of the cornea, that the original division between it and the sclerotic coat cannot be distinguished. I have seen two cases where no such line of division could be observed. Reil* could see no remains of a cornea in a blind eye, which had grown smaller for eighteen years. "The eye-ball appeared to be formed of four parts; two deep furrows divided it, which probably arose from the action of the four straight muscles."

It also sometimes happens, that the cornea is lessened to half its natural size, or is altogether wanting, from an original malconformation †.

It very frequently occurs, that the eye-ball does not recover its natural form after

* Archiv für die Physiologie, von Joh. Christ. Reil.

† Vide Handbuck der Pathologischen Anatomie, von Voigtel.

the cornea or sclerotic coat has been wounded; for although the wound heals soon after the accident, yet there is often so much inflammation excited, and such extensive injury done to the other parts of the eye-ball, that the humours are neither again collected in sufficient quantity, nor does the retina recover its tone.

Ulcers are still more apt to produce a permanent change in the form of the cornea than wounds. When they destroy its whole thickness, and allow the aqueous humour to escape, they heal so slowly that the relative situation of parts is altered: the iris comes in contact with the cornea, so that the aqueous humour oozes out until the ulcer is healed, the eye ever afterwards remaining of an unnatural shape.

Vision, in such cases, is always more or less impaired, and generally altogether destroyed.

CHAP. XIV.

OF THE EFFUSION OF BLOOD BETWEEN THE LAMELLÆ OF THE CORNEA, AND INTO THE ANTERIOR CHAMBER *.

THE effusion of blood between the lamellæ of the cornea, or into the anterior chamber, is generally the consequence either of violent inflammation or of wounds.

When treating of inflammation of the cornea, I took notice that it sometimes happened that blood was effused between its lamellæ. When this takes place, a dark red-coloured circumscribed spot appears on some part of the cornea, which never alters its situation, but remains stationary until it is absorbed.

* Hypoæma—Das Blutaug of the Germans.

When the internal parts of the eye are much inflamed, the aqueous humour often loses its natural transparency, and becomes tinged of a red colour from the mixture of blood. The red shade turns deeper as the quantity of effused blood increases, and in very violent ophthalmia, the blood is sometimes effused in such a quantity as to render the aqueous humour so opaque, that the iris and pupil cannot be distinguished. An wound of the iris, whether made accidentally or during the operation of the extraction or depression of the cataract, is very often followed by an effusion of blood into the anterior chamber; and it also happens that blood is effused, not only when an wound has been received, but even some days afterwards, probably in consequence of the subsequent inflammatino*.

I have seen several instances of an effusion of blood from an improper use of the

* This disease has been called *Cataracta secunduria Crumosa.*

couching needle, and I believe it is not an unfrequent accident. The blood, however, is, in such cases, readily absorbed, and is followed by no bad consequence.

It sometimes happens, that blood is effused into the anterior chamber, from a violent blow on the eye. A very remarkable case of this kind was under the care of Mr Campbell, surgeon of the Inverness-shire militia: In consequence of a blow with the fist, a drop of blood collected in the anterior chamber, at the junction of the cornea and iris, but in a few days it was altogether absorbed.

There are also diseases of the iris, and of the internal parts of the eye, which are attended with hemorrhage, and which tinge the aqueous humour with blood. Voigtel * mentions the following case, where the quantity of blood was so great, as to distend the eye-ball, and burst it. "A man, fifty years of age, had by degrees lost the sight

* Des Pathologischen Anatomie.

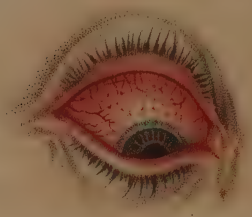
of the left eye ;—a year afterwards, a round white speck formed on the cornea, and in three months it changed to a blue colour ; for other nine months it remained in the same state, and then became inflamed, but the inflammation soon went off. One day, after this, the patient felt his eye so much distended, that it appeared to him as large as a hen's egg. This sudden swelling was accompanied with acute pain ; and when slightly pressed, the pain became extremely violent, and darted through the whole head ; at the same moment, blood flowed from the eye-lid, when the pain began to lessen and went off altogether in half an hour. The bleeding lasted two hours, and there were from five to six ounces of blood discharged—the eye-ball was afterwards completely destroyed."

EXPLANATION

OF THE

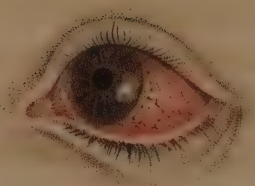
Plates.

Inflammation of the Conjunctiva.



Inflammation of the Cornea and Sclerotica coat.

Pustular Inflammation.



EXPLANATION

OF THE

PLATES.

Plate I.

The three figures of this Plate are grouped together, in order to contrast more strongly the variety in the appearances of the peculiar inflammation which is represented in each.

Fig. 1.—Represents the conjunctiva covering the sclerotic coat, and lining the eye-lids, inflamed to a considerable degree, in the left eye of a young boy, eight days after the first attack. The inflammation increased for se-

veral days afterwards, so that this drawing may be said to represent the disease in its first or active stage. The upper eye-lid is elevated, in order to show a larger surface of the eye-ball. The colour, mode of distribution, and general appearance of the blood-vessels, were accurately copied from nature. They were of a deep scarlet hue; they did not seem to run to any particular point, but anastomosed freely with each other, and gave off branches in all directions. They appeared lying loose, and quite superficial, and could be readily elevated with forceps, or on the point of a needle. The conjunctiva was slightly swelled. The cornea remained quite transparent, and none of the red vessels passed over it. There was a light blue circle at the circumference of the cornea, resembling the *arcus senilis* of old age.

The palpebræ were considerably swelled, and had a dark purplish hue externally. Their internal surface had a villous appearance, and was very turgid with red vessels, which were so numerous as not to be distin-

guished in separate trunks. The *ciliæ* were glued together with a puriform fluid, and several globules of pus were seen on the under eye-lid, floating among the tears, and collected towards the angles of the eye.

Fig. 2.—This drawing represents the inflammation of the cornea and sclerotic coat, and the commencement of a corneal speck. The general expression given to this eye differs much from that of Fig. 1. and this arises chiefly from the appearance of the blood-vessels. The inflammation is confined, or is at least much more remarkable on one half of the eye-ball. There are numerous blood-vessels on the inferior part of the sclerotic coat; which pass over the transparent cornea and form on it a red cluster. They are of a deep scarlet colour, tinged with brown; they run in nearly straight lines on the sclerotic coat, and do not give off any branches till they approach near the cornea; each trunk is seen distinct, and they appear deeper, or more in the substance of the scle-

rotic coat, than the vessels in Fig. 1. There is a small circumscribed speck near the centre of the cornea, of a circular form,—a blood-vessel is seen running towards it; the speck is rather more opaque at the centre than at the circumference. The whole anterior chamber had that muddy, turbid appearance, which disappears instantaneously when the aqueous humour is evacuated: The eye-lids were turgid with vessels, but they were not much swelled, nor of the livid colour, nor covered with a puriform fluid, as those in Fig. 1.

This drawing was taken from a young woman who had had symptoms of inflammation in the eye for about six weeks, which came on suddenly, and without any known cause; —it was accompanied with violent pain in the temples, and in the eye-ball.

Fig. 3.—This drawing represents a pustule of the cornea, which has advanced to ulceration, and the peculiar inflammation which accompanies this disease. The blood-vessels are of a pale livid colour, and are more nu-

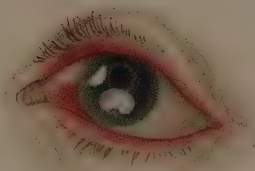
merous on the white of the eye adjoining the pustule, than at any other part. They also appear superficial when compared with those in Fig. 2.; and they anastomose freely with each other, each trunk being easily distinguished. The small white spot on the centre of the pustule, is the chalky looking matter so frequently covering ulcers of the cornea. There is also a diffused opacity round the cornea, immediately contiguous to the spot. The eye-lids are not affected, and there is no appearance of purulent matter among the ciliæ.—The drawing was taken from a young girl, six days after the commencement of the disease, who had been subject to frequent attacks of the disease, all of which were speedily removed by the application of the *vinous tincture of opium.*

PLATE II.

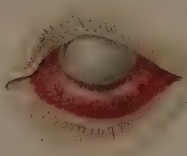
Fig. 1.—Represents the inflammation of a portion of the conjunctiva covering the cornea, as described in page 7th. The diseased portion appears of an opaque white colour, a little elevated above the natural surface of the cornea, and extending from the sclerotic coat to beyond the centre of the cornea. It has an oblong form, except near its extremity, where it becomes broader, and two large vascular trunks pass to the cornea, and are ramified into a number of minute branches when they reach the extremity of the opaque

Inflamation of the Conjunctiva of the Cornea

Ulcer of the Cornea



Death of the Cornea from Lime



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spot. The whole cornea is a little clouded. The eye-lids are swelled and turgid with blood. A comparison of this Figure with Fig. 2. Plate I. will illustrate the difference in the appearances of the inflammation of the conjunctiva of the cornea with the common corneal speck.

This drawing was taken from a young lady about eighteen years of age, who had suffered from inflammation in her eye, attended with pain in the head and temple, intolerance of light, increased secretion of tears, &c. which had continued during three months. She formerly had four similar attacks, each lasting between three and four months. In this case the vessels were divided going to the corneal conjunctiva, by introducing a very sharp pointed curved needle behind them, then elevating them, and cutting away the elevated portion with a pair of scissars. This operation was followed by an increase of the inflammatory symptoms for a few days, but they gradually abated; the diseased portion of conjunctiva came away in the

form of a slough; and, after the lapse of a considerable time, the transparency of the cornea was nearly completely restored.

Fig. 2.—Represents a cornea which has two ulcers, having an opaque white appearance, resembling a piece of wet chalk, and, on a superficial examination, liable to be mistaken for a common *speck*. The edges of these ulcers are rounded and smooth, and elevated above the level of the surface of the ulcer. The rest of the cornea is quite transparent. On the nasal side of the white of the eye, there were a considerable number of blood-vessels, terminating in an *ecchymosis*. The eye-lids are a little swelled and turgid. This drawing was taken from a gentleman upwards of fifty years of age, who I saw along with Dr Monro, junior. The ulcers arose in consequence of a blow on the eye, which produced a violent degree of inflammation that lasted four months.

Fig. 3.—Shows the opacity of the cornea produced from the action of lime, as described in page 61.

The patient was a soldier who had suffered from ophthalmia during the Egyptian campaign, and who had since been subject to weak eyes. A quantity of lime accidentally got into one of them, which gave excruciating pain in the eye and head, produced a great degree of swelling and redness of the whole conjunctiva, and rendered about two-thirds of the cornea so obscure as entirely to destroy his sight. After the violent inflammatory symptoms were abated by bleeding at the temples, scarifying the eye-lids, &c. the process of separation of the dead portion of conjunctiva commenced, and the drawing was taken when it had advanced a little way. The slough at the junction of the cornea and sclerotic coat began to separate, and vessels branched out, so that the division between these two coats, which at one period

could not be distinguished, now became visible. The separation went on from the circumference towards the centre, leaving the portion of the cornea underneath very vascular. When the white slough was touched with a pointed instrument, it appeared as if loose and moveable, and was very hard and brittle.

The whole cornea, except a small line at its upper part, is seen covered with the opaque matter, and there is also some remains of it on parts of the sclerotic coat. The conjunctiva on the sclerotic coat was a little tumefied, and instead of lying loose and moveable, it was hard and firm when cut with a scarificator. In some places it is considerably inflamed, and through the white portions small ramifications of red vessels may be observed.

Various applications were made use of during the treatment of this patient, but none had such a remarkable effect in abating the inflammatory symptoms and pain, and promoting the separation of the slough, as a so-

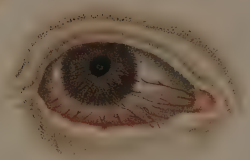
lution of the *nitrate of quicksilver*. I had an opportunity of observing the progress of the case for five months, and, at the end of that period, the whole of the slough had separated, except some small ragged portions towards the centre of the cornea. There was a degree of obscurity apparently deep seated in the cornea, but his sight was so much recovered, that, with this eye, he could distinguish large objects.

PLATE III.

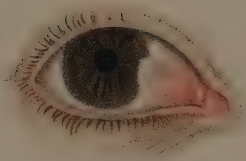
THE three figures contained in this plate are intended to explain the most remarkable appearances of *pterygium*, varying in thickness from the thin membranous pellicle to the fleshy, cartilaginous excrescence.

Fig. 1.—Represents a thin membrane, covering about one-half of the cornea and sclerotic coat, which had nearly destroyed vision. It is interwoven with blood vessels, which appear lying superficial, and of a very considerable size; both the vessels and the membrane are of a dull crimson colour. The inferior *tarsus* of this eye is also diseased,

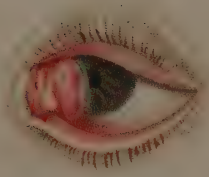
1. Membranous Pterygium.



2. Common triangular Pterygium



3. Fleshy Pterygium



the edge of it is of an irregular form, and the natural figure of the cartilage is destroyed; almost all the *ciliæ* have dropped out, and in several places the edge of the tarsus is of a bright crimson tint. The gentleman, from whose eye this drawing was taken, had been, during a course of many years, repeatedly attacked with acute inflammation in the eye. He was under the care of Drs Monro and Wardrop; and it was proposed, that the portion of the conjunctiva, which was filled with vessels, should be removed close to the circumference of the cornea. In order to do this, Dr W. introduced a curved needle underneath them, elevated them, and then snipped off the elevated portion with scissars. The portion of the membrane, which remained on the cornea after this was done, appeared very loose, and it was readily dissected off with a scalpel. A few vessels, which were then seen in the substance of the cornea, increased in size for some days after the operation, but they gradually diminished, and in a short time his sight began to improve; and

after several months, though his other eye was completely lost, it was so much recovered, that he was able with it to read and write. Two years after the operation, his eye continued well.

Fig. 2.—Is a drawing of the most usual appearance of the pterygium, where the triangular form is well marked. Its base adheres to the semilunar membrane, and its apex extends a little way over the cornea. The vessels, in this case, instead of being of a dull crimson colour, as in Fig. 1. were of a pale scarlet. They are in considerable numbers, all small, and running in nearly straight lines towards the apex of the pterygium. The new formed body appears of considerable thickness, and lies loose, except at its base and apex. I had an opportunity of observing the progress of this case for upwards of eight years. When I first saw it, it had the appearance of a small globule of fat near the junction of the cornea and sclerotic coat, and it gradually became larger, so that its base adhered to the semilunar fold, and

its apex passed over the edge of the transparent cornea.

Fig. 3.—This drawing was taken from the eye of a young gentleman, who had the common triangular shaped pterygium from early life. Its growth having become rapid, a surgeon attempted to remove it by repeated scarifications; but these, instead of causing it to diminish, made it grow more rapidly. The mass was so large, as to separate the two tarsi, and involved the semilunar membrane and lacrymal caruncle. The surface of the pterygium was very irregular and rough, and some of the most prominent parts were white and hard; the rest of the tumour was of a bright red colour, bordering on vermilion; round the anterior extremity there was a ring of opaque cornea, more like the *arcus senilis* than common speck.

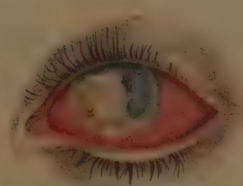
PLATE IV.

Fig. 1.—Was taken from the case described in page 31, where a fleshy excrescence, adhering to the conjunctiva of the cornea and sclerotic coat, has a tuft of hair growing from it.

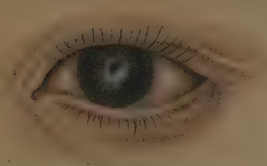
Fig. 2.—Represents a collection of puriform fluid in the anterior chamber, in a man about forty years of age. There is also a considerable degree of cloudiness of the cornea, and its surface in some parts was eroded. The conjunctiva, covering the sclerotic coat, and lining the palpebræ, has become

Tumor of the Conjunctiva with hairs growing from it

Purulent matter in the anterior chamber
with opacity of the Cornea



Deep Ulcer with thickening of the Cornea



P. Syme pinx.

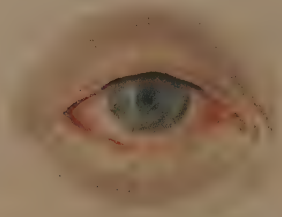
very red, from violent inflammation, and some of the red vessels may be seen passing over the cornea.

When mining coals, a piece of the rock struck this patient's eye, and the drawing was made twenty-one days after the accident. It gave him great pain, and the pain daily increased, and became particularly severe in the forehead and temples, so as entirely to deprive him of sleep. The vision of this eye was destroyed, and he could only distinguish very large objects with the other eye, in consequence of an opaque speck of the cornea, which had formed early in life. I made an incision through the cornea, similar to that for the extraction of the cataract, and several drops of a puriform matter rushed out along with the aqueous humour. The effect of this discharge was almost instantaneous; for though the operation caused considerable smarting, and the fixing of the eye-ball produced a good deal of uneasiness, yet as soon as the contents of the anterior chamber were discharged, the

deep seated pain in the eye-ball, and the oppressive pain in the head, vanished. The pain never again returned, and the cornea daily regained so far its transparency, by scarification of the eye-lid, and the application of stimulating ointments, as to enable him again to be employed as a miner.

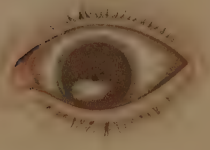
Fig. 3.—Represents an ulcer of the cornea, the appearances of which are very different from that of Fig. 3. Plate II. Instead of the superficial ulceration, and the surface being covered with an opaque white matter, there is a deep hollow cavity, of a conical form, the apex inclining towards the pupil. There is a degree of muddiness of the cornea, and it is very considerably swelled and thickened. This ulcer was the consequence of a tedious inflammation in a child's eye. By the continued use of the *vinous tincture of opium* for some weeks, the cavity of the ulcer was filled up, and the transparency of the cornea much restored.

Obscurity of the Cornea accompanied with Ectropium.



Circumscribed Speck with a blood vessel passing into it and the under Eyelid inverted.

Dark coloured Speck with adhesion of the Iris and contracted Pupil.



P. Syme ad v. Nat. pinxt.

PLATE V.

Fig. 1.—Shows the cornea in the *first* form of corneal speck, where it has become nebulous, or has a general cloudiness diffused over it. The degree of opacity is such, that the iris and pupil can be seen through it very indistinctly, and some parts are rather more opaque than others. The obscurity of the cornea was, in this instance, occasioned by that disease of the tarsi, called *entropeon,* in which the tarsi are turned in upon the eye-ball. All the ciliæ have dropped out; the cartilages have lost their natural form, and their

edges become ragged. In this case, in order to restore the two tarsi into their natural situation, the ingenious operation of Mr Crampton of Dublin was employed, viz. dividing them at their junction, at the temporal angle of the eye, and after thus liberating the two eye-lids, keeping them in their natural situation, in the manner Mr Crampton points out *.

Fig. 2.—This drawing is intended to represent a corneal speck, of the *second* form. The speck is distinctly circumscribed, but not of an equal degree of opacity throughout. It is so situated, as to hide nearly the whole pupil. Towards its circumference, the iris may be observed shining through it. One small vascular trunk creeps along the sclerotic coat, passes over the edge of the cornea, and is lost on the speck. The patient had been seized twenty-two months before with a violent inflammation in his

* Vide an Essay on the Entropeon, by Philip Crampton, M. D. London, 1805.

eye, after which the speck was formed, and, at the same time, the inferior eye-lid was inverted.

The tarsus is completely out of view, and is turned in upon the eye-ball; but the integuments of the eye-lids were so loose, that it could be easily put into its natural situation, and it remained there till, by a convulsive twitch of the eye-lids, it was again thrown inwards. The integuments of the upper eye-lid are loose and puckered, from the constant winking, and corrugation of the eye-brow, which always accompanies this disorder. This and the former figure show two very different varieties of the entropeon, and explain also the very different modes of treatment necessary to be employed in each.

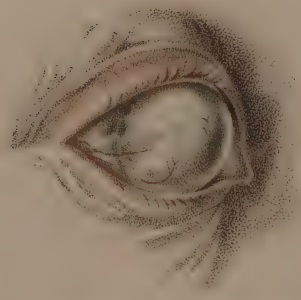
The tarsus was restored to its natural situation by removing a portion of the skin of the eye-lid, and keeping the divided edges of the wound in close contact, by three ligatures and adhesive plasters. When this was done, the inflammation speedily abated, and the speck diminished in opacity; thin layers

of it were also removed with a scalpel, so as to destroy the red vessel which passed into it; and by this treatment the speck became so small in a few weeks, that the man, from being quite blind, having lost completely the sight of the other eye, was enabled to walk about the streets, and distinguish objects with considerable accuracy.

Fig. 3.—Shows the appearance of a very thick pearl-coloured speck, of the *third* form, where, in consequence of an adhesion of the iris to the cornea, the pupil is drawn from the centre of the eye, and contracted to a very small point, so as nearly to destroy vision. The boy, from whom the drawing was taken, had lost also the sight of the other eye, from a violent inflammation after measles. It is one of those few cases where an artificial pupil may be attempted to be made, but, in this instance, the boy was too young to submit to the operation.

Undefined Speck with adhesion of the Iris.

Complete Staphyloma of the Cornea



Partial Staphyloma of the Cornea

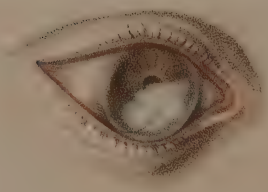


PLATE VI.

Fig. 1.—Represents a corneal speck of the most opake, and, indeed, of the most incurable kind. It occupies the centre of the cornea, and is of a very irregular shape. It is of a pearl-white colour, and is nourished by several red-vessels. The cornea has lost its smooth spherical surface, from the cicatrix of an ulcer on the central part of the opacity. The speck is so large and opaque as to allow only a very small portion of the iris to be distinguished through it at its circumference. The cornea and iris also adhere to one another. The woman, from

whom the drawing was taken, had suffered repeatedly from violent attacks of inflammation in the eyes for three years.

Fig. 2.—Represents a complete staphyloma of the cornea in a man twenty-five years of age. It was produced by a violent inflammation, which followed a wound of the eye with a sharp-pointed instrument, two years before. It is of such a bulk as not to be entirely covered by the eye-lids. There still remains a line of division between the cornea and sclerotic coat. The cornea is formed into a tumour, nearly globular, and of an opaque white, and, in some parts, of a bluish, pearl colour. Over several parts of it are seen ramifications of red vessels. The sclerotic coat has lost its natural whiteness and lustre, and has a greenish hue. The palpebræ are inflamed, and many of the ciliæ have dropped out.

Fig. 3.—Is an example of what has been called the *partial staphyloma;* as only a portion

of the cornea is affected. The distinction is a useless one, both in a pathological and practical point of view. In this case, where the disease came on in consequence of the other eye having become staphylomatous from an wound, a portion of the cornea became obscure, and more prominent than natural; and although a part of the cornea immediately opposite the pupil remained transparent, yet its increased sphericity destroyed vision. The speck was of a pearl-colour, and was nourished by a blood-vessel: An adhesion had taken place between the cornea and the iris.

PLATE VII.

Fig. 1.—Is an outline taken from the eye of Miss ———, as described in page 119, when viewed laterally, showing a cornea having assumed a conical form, whilst, at the same time, it remained transparent.

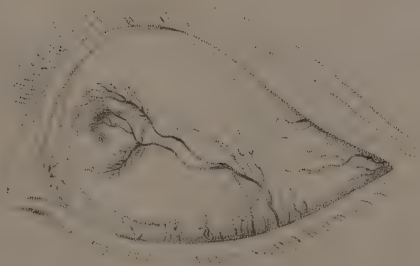
Fig. 2.—This is an outline of the case described by Beer, as quoted in page 122, in which the cornea is very much distended from hydrophthalmia.

Fig. 3.—This figure is a magnified view of a staphyloma, showing the mode of distribu-

Conical formed Cornea

Cornea distended from Hydrophthalmia

Map of the Bloodvessels of a Staphyloma



tion of its blood-vessels. The appearances of the two large trunks which advance to the extremity of the tumour were very remarkable, from the difference in their colour at different points. About one half of the trunk was of a pale livid hue; the contiguous portion became suddenly of a deep crimson, and the minute ramifications were of a reddish brown tint.

It is difficult to give a satisfactory explanation of this appearance, but to the physiologist the fact appears interesting. The difference in the quantity and in the chemical qualities of the blood in the trunks and extremities of the vessels, and the difference in the thickness of the coats of the vessels in the different parts, may all have a certain share in producing this appearance.

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